

REPORT

on implementation of milestones of the 3d quarter of the 4th year
of the Joint Ukrainian-American Scientific Project

«Study of Thyroid Cancer and Other Thyroid Diseases in Ukraine Following the Chornobyl Accident»

Project Manager

A handwritten signature in black ink, appearing to be 'M. Tronko', written in a cursive style.

Dr. M. Tronko

(December 1999 - February 2000)

1 Management and administration

1.41 To organize screening by mobile medical teams, of cohort members residing in Chernihiv raion of Chernihiv oblast.

Screening examinations of cohort members residing in Chernihiv raion of Chernihiv oblast have been performed by mobile medical teams. 107 cohort members have been examined.

1.42 To organize screening by mobile medical teams, of cohort members residing in the town of Chernihiv.

Screening examinations of cohort members residing in the city of Chernihiv have been performed by mobile medical teams. 111 cohort members have been examined.

1.43 To organize screening by mobile medical teams, of cohort members residing in Ivankiv raion of Kyiv oblast.

Screening examinations of cohort members residing in Ivankiv raion of Chernihiv oblast have been performed by mobile medical teams. 60 cohort members have been examined.

1.44 To organize transportation of cohort members who are residing in Kozelets raion of Chernihiv oblast for screening examination by stationary medical team on the basis of the Clinic of the Institute of Endocrinology and Metabolism of the AMS of Ukraine

It has been organized transportation of cohort members who are residing in Kozelets raion of Chernihiv oblast for screening examination by stationary medical team on the basis of the Clinic of the Institute of Endocrinology and Metabolism of the AMS of Ukraine. 131 cohort members have been examined.

1.45 To organize screening by mobile medical teams, of cohort members residing in Ovruch raion of Zhytomyr oblast.

Screening examinations of cohort members residing in Ovruch raion of Zhytomyr oblast have been performed by mobile medical teams. 323 cohort members have been examined.

1.46 To organize screening by mobile medical teams, of cohort members residing in Narodychi raion of Zhytomyr oblast.

Screening examinations of cohort members residing in Narodychi raion of Zhytomyr oblast have been performed by mobile medical teams. 170 cohort members have been examined.

1.47 To organize, on the basis of the Clinic of the Institute of Endocrinology and Metabolism of the AMS of Ukraine, screening by stationary medical team, of cohort members who have

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been relocated from Chornobyl, Polisia raions, and town of Prypyat' of Kyiv oblast, to other raions of this oblast.

Screening examination of 152 cohort members by stationary medical team has been organized on the basis of the Clinic of the Institute of Endocrinology and Metabolism of the AMS of Ukraine.

For the reported period a total of 1054 cohort members have been examined.

1.48 To organize meetings (on the spot) in order to discuss progress in Project implementation and prospects of its intensification in year 2000, with medical authorities of oblasts and raions controlled according to the Project Protocol.

A meeting (on the spot) has been organized and held on December 15, 1999, devoted to progress in Project implementation and prospects of its intensification in year 2000, with medical authorities of Ovruch and Narodychi raions of Zhytomyr oblast.

1.49 To organize a seminar devoted to the issues of medical screening of cohort members, with involvement of medical workers of the controlled raions, who are responsible for screening.

A seminar devoted to the issues of medical screening of cohort members has been organized and held on December 22-23, 1999, with involvement of medical staff responsible for screening in controlled raions.

1.50 To organize transfer, to Project participants and medical authorities of controlled raions, of the results of medical examinations performed in the process of screening.

The results of medical examinations performed in the process of screening have been transferred to Project participants and medical authorities of controlled raions.

1.51 To carry out preparatory work in order to purchase a bus for cohort member transportation from their place of residence to the Clinic of the Institute of Endocrinology and Metabolism for screening.

Preparatory work for purchasing a bus for cohort member transportation from their place of residence to the Clinic of the Institute of Endocrinology and Metabolism for screening has been performed. Contacts have been established with the management of Lviv automobile plant, the type of bus has been determined, as well as its technical parameters and cost. Direct contacts have been established between the commercial department of Lviv automobile plant, and Dr. Ihor Masnyk, Project Manager from the U.S.A and Project participants from Columbia University.

1.52 To organize the final stage of the process of localization and identification of potential cohort members of first selection.

The final stage of the process of localization and identification of potential cohort members of first selection has been organized. The results are given in Chapter 4 "Screening organization and performance".

1.53 To perform a work in order to establish the cohort of second selection. Localization and identification of this cohort.

A work connected with formation of the cohort of selection 2 has been performed. The results are given in Chapter 2 "Establishment of the cohort".

1.54 To organize (twice a month) meetings of Project management in order to discuss progress in Project implementation.

3 meetings of Project management have been organized and held (once a month) in order to discuss progress in Project implementation.

1.55 To make an inventory of equipment and supplies received in the framework of the Project.

An inventory of equipment and supplies received in the framework of the Project, has been made.

1.56 To prepare custom clearance documentation for shipments received in the framework of the Project.

Custom clearance documentation for shipments received in the framework of the Project, has been prepared (list enclosed).

2 Establishment of the cohort

2.14 To complete search of cohort members in Kyiv oblast using card index of the Chornobyl Department of Kyiv oblast.

Search of cohort members of selection 1 using the database of the Chornobyl Department of Kyiv oblast, has been completed.

Institute's staff has been working with the file of this Department. For all the period of search, information on 1885 former inhabitants of the towns of Chornobyl and Prypyat, Chornobyl raion, has been reviewed. 987 persons (52%) have been found. It has been established that 71 persons have moved abroad, 92 represent duplicated records; information has not been found for 659 persons (34%).

Efficacy of use of two main sources for Kyiv oblast - Passport Office and Chornobyl Department - is being compared in Table 1. Though there is a certain percentage of persons who

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have been found in both sources, for the majority of migrants from Chornobyl raion and Prypyat information has been found only in one file.

Table 1. Comparison of the efficacy of search in Passport Office of the city of Kyiv and Chornobyl Department of Kyiv oblast.

	Information source		
	Passport Office of the city of Kyiv	Chornobyl Department of Kyiv oblast	Were searched or found in both information sources
Number of people who were searched using the information source in question	3318	1885	1115
Have been found	1865	987	313
Have emigrated	28	71	12
Provisionally absent	7	0	0
No exact address	86	73	5
Duplicated records	74	92	18
Relocated, new address is unknown	4	3	0
Deceased	11	0	0
Not found	1243	659	278

2.18 *To finish search of cohort members in Zhitomyr oblast using data of the Department For emergency situations and civil protection of population of Zhitomyr Oblast State Administration, in the Department of social protection of population of Zhitomyr oblast state administration, in the Military enlistment Office, in the State Taxation Administration of Zhitomyr Oblast State Administration, in the Department of Education of Zhitomyr Oblast State Administration.*

Search is being performed of cohort members of Zhytomyr oblast who have not been found so far or have moved and their address is unknown (1364 persons for the 26.10.99) in State Fiscal Administration of Zhytomyr oblast. Search is being performed of cohort members of Zhytomyr oblast who have not been found so far or have moved and their address is unknown (572 persons for the 26.10.99) in the Department of Education of Zhytomyr Oblast State Administration. Search has been completed of cohort members of Zhytomyr oblast who have not been found so far or have moved and their address is unknown (1364 persons for the 26.10.99) in the Military Registration and Enlistment Office of Zhytomyr oblast.

2.19 *To finish search of cohort members in Chernihiv oblast using data of the Military enlistment Office of Chernihiv oblast, Data of the Chornobyl Department of Chernihiv oblast, in the State Taxation Administration of Chernihiv oblast, in the Department of Education of Chernihiv oblast*

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Through Chernihiv Military Registration and Enlistment Office, search of subjects (355 persons) who had a status of persons having not been found, has been performed.

Search has been completed. 59 persons with an exact address who reside in the town of Chernihiv, have been identified. Besides, medical staff of pediatric polyclinics of the town of Chernihiv have identified the exact address of additional 42 persons born in 1982-1986 who were considered as persons having not been found.

An official authorization has been obtained from the State Administration of the town of Chernihiv for search of cohort members in State Fiscal Administration, and lists for search of 2182 persons have been transmitted. The possibility of performing this volume of work is being discussed with the representatives of this organization.

It has been prepared and transmitted to passport offices of Chernihiv oblast, for search of exact address, lists of persons who have not been found before, had the status of relocated persons, were identified, but without exact address, are provisionally absent, and who were not searched in passport offices (1175 persons). This work is planned to be completed in March 2000.

2.20 To finish search of cohort members in Kyiv oblast using data of the Military enlistment Office of Kyiv oblast, in the State Taxation Administration of Kyiv oblast, in the Department of Education of Kyiv oblast.

Search of cohort members of selection 1 using the data of Military Registration and Enlistment Office of Kyiv oblast, State Fiscal Administration of Kyiv oblast, and Department of Education of Kyiv oblast, will be continued in the next quarter.

A list of 184 persons who, according to preliminary data, have been relocated to the town of Slavutych, but their exact mail address is unknown, has been transmitted to the Passport Office of the town of Slavutych. A list of 1192 persons who have not been found in Chernihiv oblast, since people were relocated to Slavutych mainly from Chernihiv oblast, has been transmitted.

For search using the archives of the Passport Office of the town of Prypyat, which is located in Slavutych, a list has been provided which includes 291 former inhabitants of Prypyat who have not been found in other information sources.

2.21 To prepare lists of cohort members of Selection 2 and to start manual search with the help of local medical staff and Oblast Passport Bureau.

Lists of cohort members of selection 2 for Chernihiv oblast have been prepared for manual search with the help of local medical staff and oblast passport offices. Selection 2 of cohort members for Chernihiv oblast, whose addresses will be established, consists of 11130

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persons. Taking into account the great volume of the work to be performed, search is planned to be completed by the end of June 2000.

2.17 To summarize obtained address information.

Information received for the 1.03.2000, concerning the present address of cohort members, is summarized in Tables №2.2 and 2.3

Table 2.2		New addresses found of cohort members of 1986										01.03.00	
Raion	Total in 20,000-cohort of 1986	Total of subjects identified	%	Deceased	%	Duplicated records	%	Moved. Address unknown	%	Emigrated	%	Not found so far	%
Town of Prypyat	1584	1168	74%	4	0%	86	5%	4	0%	71	4%	251	16%
Polisya	1399	663	47%	5	0%	38	3%	1	0%	5	0%	717	51%
Ivankiv	737	607	82%	3	0%	15	2%	24	3%	4	1%	84	11%
Chornobyl	1484	1042	70%	2	0%	37	2%	0	0%	7	0%	396	27%
Total for Kyiv oblast	5204	3480	67%	14	0%	176	3%	29	1%	87	2%	1448	28%
Kozelets	2089	1359	65%	10	0%	18	1%	109	5%	24	1%	569	27%
Ripky	1377	1001	73%	15	1%	45	3%	42	3%	80	6%	194	14%
Chernihiv	2858	2054	72%	20	1%	158	6%	244	9%	33	1%	349	12%
City of Chernihiv	1192	812	68%	5	0%	2	0%	15	1%	19	2%	339	28%
Total for Chernihiv oblast	7516	5226	70%	50	1%	223	3%	410	5%	156	2%	1451	19%
Narodychi	4279	2536	59%	21	0%	883	21%	4	0%	43	1%	792	19%
Ovruch	3072	2249	73%	23	1%	75	2%	138	4%	118	4%	469	15%
Total for Zhytomyr oblast	7351	4785	65%	44	1%	958	13%	142	2%	161	2%	1261	17%
Total	20071	13491	67%	108	1%	1357	7%	581	3%	404	2%	4160	21%

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Table 2. 3		Cohort status with address found						01.03.00	
Raion	Total of subjects identified	Reside within the raion	%	Reside within the same oblast	%	Reside in another oblast	%	Provisionally absent	%
Town of Prypyat	1168	16	1%	773	66%	377	32%	2	0%
Polisya	663	96	14%	469	71%	66	10%	2	0%
Ivankiv	607	531	87%	55	9%	19	3%	4	1%
Chornobyl	1042	148	14%	757	73%	128	12%	9	1%
Total for Kyiv oblast	3480	791	23%	2054	59%	590	17%	17	0%
Kozelets	1359	1059	78%	77	6%	146	11%	77	6%
Ripky	1001	679	68%	214	21%	49	5%	59	6%
Chernihiv	2054	1554	76%	382	19%	55	3%	63	3%
own of Chernihiv	812	706	87%	55	7%	22	3%	29	4%
Total for Chernihiv oblast	5226	3998	77%	728	14%	272	5%	228	4%
Narodychi	2536	1023	40%	881	35%	608	24%	24	1%
Ovruch	2249	1797	80%	116	5%	302	13%	34	2%
Total for Zhytomyr oblast	4785	2820	59%	997	21%	910	19%	58	1%
Total	13491	7609	56%	3779	28%	1772	13%	303	2%

3. Invitation of patients for endocrinologic screening

3.12 *To continue obtaining and analyzing information on people who didn't come for the examination in all raions under study where examination already took place (Ovruch raion of Zhytomyr oblast, Narodychi raion Zhytomyr oblast, Kozelets raion Chernihiv oblast. Chernihiv raion Chernihiv oblast, Ivankiv raion of Kyiv oblast)*

Work is being continued for obtaining and analysing information on persons who have not come to examination in Ovruch and Narodychi raions of Zhytomyr oblast, in Kozelets, Ripky and Chernihiv raions of Chernihiv oblast, in Ivankiv raion of Kyiv oblast.

In order to improve screening efficacy, final variants of the following documents have been worked out: "Dynamics of patients' invitation", "Invitation for screening", "Thanks to the Administration of the Ukraine-US Project", Information booklet for a Project participant", "Card of a potential participant in Ukraine-US Project", financial information for Project participants concerning reimbursement of their expenses. The logotype of Ukraine-US Project has been developed, documents have been prepared and submitted in order to register this logotype as a trade mark in State enterprise "Institute of Industrial Property".

Reimbursement of indemnity to cohort members from controlled raions who have undergone medical examination, has been organized.

A workshop has been held with contact persons from controlled raions according to the Project (December 1999). An instruction has been developed for contact persons. A preliminary schedule for screening by mobile teams in controlled raions for January-March 2000 has been discussed. A package of relevant Project documents has been prepared and transmitted to local raion staff.

3.24 *To send invitations to cohort members currently living in Kyiv oblast and who haven't been invited for screening before; based on the answers received make a schedule of work for fixed and mobile teams.*

Invitation letters have been sent out to cohort members inhabitants of Kyiv oblast.

	Number of invitations sent out
City of Kyiv	470
Ivankiv raion *	498
Polisya raion	124
Town of Slavutych	88
Other raions of Kyiv oblast	1214
Total	2394

* Including inhabitants of the former Chornobyl raion which is now a part of Ivankiv raion.

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Inhabitants of the city of Kyiv and Ivankiv raion of Kyiv oblast had been already invited for screening before. Invitations have been sent out to Polisia raion, town of Slavutych, and other raions of Kyiv oblast for the first time.

Preliminary information concerning answers to invitations is given in Table 3.1.

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Table 3.1. Answers of cohort members of Kyiv oblast to invitation

Raion	Number of invitations sent out	Number of letters having been returned due to a wrong address	% from the number of invitations	Persons having consented to screening			% from the number of invitations	Persons having refused screening	% from the number of invitations
				By stationary team	By mobile team	Place does not matter			
City of Kyiv	470	9	1,9	54	0	2	56	4	0,9
Ivankiv raion	498	2	0,4	50	38	6	94	0	0,0
Polisya raion	124	22	17,7	20	8	2	30	3	2,4
Town of Slavutych	88	4	4,5	21	17	3	41	0	0,0
Other raions	1214	46	3,8	470	63	13	549	4	0,3
Total	2394	83	3,5	615	126	26	770	11	0,5

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Data given in the Table are preliminary ones; answers from cohort members continue to arrive and are being entered into computer.

The schedule of work of stationary team is being drawn up on the basis of telephone calls of cohort members. Cohort members from all oblasts are registered for examination by stationary team, but most of them are living in the neighbouring Kyiv oblast. In January-February 2000 74 inhabitants of Kyiv and Kyiv oblast, who have received a written invitation for screening, have been registered by telephone. A total of 202 inhabitants of Kyiv and Kyiv oblast have been examined for the reported period.

Kyiv oblast	202
Ivankiv raion	74
Polisya raion	3
Chornobyl raion	7
Town of Prypyat	0
City of Kyiv	41
Other raions of Kyiv oblast	77

It should be noted that a certain percentage of persons fix the day of examination and come to examination without having confirmed their consent by sending a card.

3.25. *To send New Year greetings and Thank you letters to all cohort members who were examined earlier.*

In the current quarter, seasonal greetings cards have been prepared and sent out to all cohort members of Kyiv, Zhytomyr, and Chernihiv oblasts who have undergone examination in the framework of the Ukraine-US Project.

Information about sending correspondence to raions		
Raion	Thanks	Invitations
Ivankiv	192	385
Polisya	0	124
Chornobyl	42	113
Prypyat	0	0
Kyiv	506	470
Other raions of Kyiv oblast	0	1218
Narodychi	537	454
Ovruch	1003	804
Other raions of Zhytomyr oblast	68	789
Ripky	599	120
Chernihiv	708	904
Town of Chernihiv	527	399
Kozelets	715	343
Other raions of Chernihiv oblast	0	45
Town of Slavutych	0	88
Total	4897	6256

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Seasonal greetings cards have been also sent to persons who had been invited to examination (11153).

Beginning from the 17.01.2000, the subjects examined will receive a thanks letter from the team leader at once after their examination.

3.26 To send invitations to cohort members currently living in Zhitomyr oblast and who haven't been invited for screening before, based on the answers received make a schedule of work for fixed and mobile teams.

Invitations have been prepared and sent out to cohort members of Narodychi (454 cards), Ovruch (804 cards), and other (789 cards) raions of Zhytomyr oblast, who have not undergone examination.

3.27 To send invitations to cohort members currently living in Chernihiv oblast and who haven't been invited for screening before, based on the answers received make a schedule of work for fixed and mobile teams.

Invitations, information booklets, cards of a Project participant, and financial notifications have been sent out to all cohort members of Chernihiv oblast who have not been examined, but had an exact address (1811 persons). Near 580 cards have been answered by potential screening participants, and 55 letters returned for address verification. 10 persons have refused to participate in screening (they do not wish or are not interested by their health). The rest of the subjects gave their consent for screening. Most of them would like to be examined at their place of residence, certain persons want to be examined only in Kyiv, taking into account travel expenses.

On the basis of the answers received from screening participants and the number of these found in raions, a final schedule of screening in Ripky, Chernihiv raions, and in the city of Chernihiv has been drawn up. The cohort members of Kozelets raion will be examined by the stationary team at the Clinic of the Institute of Endocrinology and Metabolism (Kyiv) according to their wish.

3.28 To perform repeated invitations of cohort members in the town Ovruch and town Narodichy of Zhitomyr oblast make a schedule of work for mobile teams.

Cohort members of Narodychi (454 persons for the 18.01.00) and Ovruch (804 persons for the 18.01.00) raions of Zhytomyr oblast have been invited for screening.

2.29 To perform repeated invitations of cohort members in the Chernihiv rayon and in the city of Chernihiv make a schedule of work for mobile teams.

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Invitation, by local medical staff of Chernihiv raion and town of Chernihiv, those cohort members who gave their consent for screening by mobile teams, is being performed.

For the reported period (December 1999-February 2000), 358 cohort members have undergone screening endocrinological examinations in Chernihiv oblast.

3.30 To perform repeated invitations of cohort members in the Ivankiv rayon of Kyiv oblast, make a schedule of work for mobile teams.

Cohort members of Ivankiv raion of Kyiv oblast have been invited once again for screening. Taking into account the number of persons to whom a written invitation has been sent, a schedule of screening has been drawn up for the mobile team. 105 visits have been appointed, and 67 persons have come to these appointments.

Table 3. Number of cohort members having been examined for the 01.03.2000

Raion	In 20.000-cohort in 1986	Reside in the raion (in 1999)	Number of persons examined	% (from the number of those who reside in the raion)	Remaining persons for screening	% (from the number of those who reside in the raion)
Kyiv oblast	5204	2971	931	31,3	2040	68,7
Ivankiv	737	567	265	46,7	302	53,3
Polisya	1399	101	3	3,0	98	97,0
Chornobyl	1484	151	52	34,4	99	65,6
Town of Prypyat	1584	15	0	0,0	15	100,0
City of Kyiv		967	532	55,0	435	45,0
Other raions of Kyiv oblast		1170	79	6,8	1091	93,2
Zhytomyr oblast	7351	3419	2098	61,4	1321	38,6
Narodychi	4279	943	678	71,9	265	28,1
Ivruch	3072	1749	1324	75,7	425	24,3
Other raions of Zhytomyr oblast		727	96	13,2	631	86,8
Chernihiv oblast	7516	4474	2842	63,5	1632	36,5
Ripky	1377	717	602	84,0	115	16,0
Chernihiv	2858	1571	767	48,8	804	51,2
Town of Chernihiv	1192	1010	638	63,2	372	36,8
Éizelets	2089	1034	818	79,1	216	20,9
Other raions of Chernihiv oblast		142	17	12,0	125	88,0
Other oblasts of Ukraine			7			
Total	20071	10864	5878	54,1	4986	45,9

4 Endocrinologic examination of the subjects

4.6 To perform screening by mobile teams of cohort members residing in Chernigov, Zhytomyr and Kyiv oblasts.

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4.7 *To perform screening by fixed team, on the base of the Institute of Endocrinology and Metabolism, of cohort members residing in Ivankov raion of Kyiv oblast.*

For the reported period, a total of 1054 cohort members from Kyiv, Zhytomyr, Chernihiv oblasts, and those relocated from the town of Prypyat in 1986, at present, inhabitants of the city of Kyiv, have been examined (770 by mobile teams, 284 by stationary team).

No pathology has been revealed in 780 persons.

Diffuse goiter, degree 1 - 212 cases

Diffuse goiter, degree 2 - 25 cases

Mixed goiter, degree 1 - 9 cases

Mixed goiter, degree 2 - 6 cases

Nodular goiter, degree 1 - 11 cases

Nodular goiter, degree 2 - 5 cases

Multinodular goiter, degree 1 - 1 case

Multinodular goiter, degree 2 - 2 cases

Autoimmune thyroiditis:

hypertrophic form - 2 cases

postoperative hypothyroidism - 1 case

5 Operation of the Central Laboratory

5.2 *To perform all laboratory investigations in the process of screening.*
Central Laboratory

I. The following blood assays have been performed:

1. Thyrotropin: 1994 persons, among which:

normal level (0.4 - 4.0 mU/l) - 1804 persons (90.5 %);

below the normal level - 14 persons (0.7%);

above the normal level (4.1 - 5.0 mU/l) - 94 persons (4.7%);

above the normal level (5.1 - 10.0 mU/l) - 74 persons (3.7%);

over 10.1 mU/l - 8 persons (0.4%).

2. Anti-TPO: 2162 persons, among which:

normal level (0-60 U/ml) - 2042 persons (94.4%);

above the normal level (61-200 U/ml) - 44 persons (2.0%);

above the normal level (201-500 U/ml) - 21 persons (1.0%);

above the normal level (501-1000 U/ml) - 12 persons (0.6%);

over 1001 U/ml - 43 persons (2.0%).

3. Thyroglobulin: 2418 persons, among which:

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normal level (2,0 - 70 ng/ml) - 2208 persons (91,31%);
below the normal level - 90 persons (3,72%);
above the normal level (71 - 200 ng/ml) - 115 persons (4,75%);
above the normal level (201-300 ng/ml) - 4 persons (0,16%);
above the normal level (301-400 ng/ml) - 1 person (0,04%).

4. Calcium: 1128 persons, among which:
normal level (1,05 - 1,35 mmol/l) - 822 persons (72,9%);
above the normal level - 12 persons (1,1%);
without correction - 294 (26,0%).

II. Biopsies of thyroid neoplasms have been performed in 13 persons, among which:
In one case carcinoma has been suspected.

III . Urinary iodine tests

For the reported period, urinary iodine excretion tests have been performed in 968 persons examined who were children and adolescents at the moment of the Chernobyl accident and are living in settlements of Narodychi and Ovruch raions of Zhytomyr oblast, Chernihiv raion of Chernihiv oblast, and Ivankiv raion of Kyiv oblast. Investigation of iodine excretion was being performed using cerium-arsenite method according to R. Gutekunst technique modified by A.D. Dunn. Urinary iodine excretion under 20 $\mu\text{g/l}$ was reported in 21 % of the persons examined; iodine concentration from 20 to 50 $\mu\text{g/l}$ was found in 39 % of study subjects. Urinary iodine content from 50 to 100 $\mu\text{g/l}$ has been revealed in 27 % of the persons examined. Iodine excretion over 100 $\mu\text{g/l}$ was reported in 13 % of study subjects. The results obtained point out a moderate and low degree of iodine deficiency, according to WHO criteria, in the persons examined from controlled regions of Ukraine.

6 Operation of Data Coordinating Center

6.36 *To enter data into Project DB (registration journals, dynamics of patients' invitation).
To keep the database of registration information. Operation with data of magneto-optical images. To prepare materials necessary for screening team and Epidemiology Group functioning.*

For the reported period, input of registration journals of examination by stationary and mobile teams has been performed. Database of registration information (input of passport data, registration of entering and transmitted forms) was being maintained.

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Duplicated screening forms have been tied, and ID-codes stuck on those forms where they were missing.

For the reported period, processing of correspondence received from potential cohort members was being performed.

1151 results of contact from cards of potential cohort member have been entered into the database of contacts.

Raion	Number
Kyiv oblast	694
Zhytomyr oblast	371
Chernihiv oblast	86
Total	1151

1511 forms have been prepared in order to be provided to team's leaders for final conclusion. Copies of blood examinations and conclusion have been prepared in order to be sent to patients in raions.

Narodychi raion	42
Ivankiv raion	27
Chernihiv raion	155
Kozelets raion	254
TOTAL	478

Lists «Dynamics of patients' invitation for screening» have been drawn up for all the raions of Zhytomyr and Chernihiv oblasts, and Ivankiv raion of Kyiv oblast. Lists of persons examined have been prepared for all raions under study.

A program for printing Form 2 of financial report has been developed. (In order to indemnify for the expenses incurred those cohort members who have undergone screening before January 1, 2000).

A program has been developed for automatic computing of Tables reflecting cohort state (status, distribution of identified and examined subjects by raions, gender and age).

Input of data on the dynamics of patients' invitation has been performed for Ripky and Chernihiv raions.

338 final conclusions have been prepared, registered in database and transmitted to patients from Zhytomyr oblast.

On request of Epidemiology Group, recoding of reference information concerning the results of contact and causes of refusal has been performed. The DB of contacts and program for input of results of contact with patients have been modified according to new codes and invitation card.

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Contacts on the phone and registration in order to examine cohort members have been made.

6.37 Sample 2 of the cohort. To prepare lists and materials for Sample 2 cohort members searching.

Formation of 20000-cohort (selection 2) has been definitively completed. The cohort has been distributed according to controlled raions.

DISTRIBUTION OF RECORDS BY DOSES AND RAIONS

Raion	Number of records in 75000 file				Number of records left in the initial file after selection 1 (55000 file)					Number of records in selection 2 (20000 records from 55000)			
	A	B	C	Total	A	B	C	Total	% from 75000	A	B	Total	% from 75000
Ivankiv	2847	608	237	3692	2521	434	0	2955	80	940	146	1086	29
Chornobyl	2303	1264	876	4443	2034	925	0	2959	67	723	337	1060	24
Polisya	2215	1142	850	4207	1964	844	0	2808	67	675	296	971	23
Town Prypyat	2066	1249	1015	4330	1845	901	0	2746	63	655	320	975	23
Narodychi	1455	2482	3457	7394	1298	1817	0	3115	42	461	669	1130	15
Ovruch	7802	4182	1144	13128	6992	3064	0	10056	77	2518	1130	3648	28
Ripky	5532	1564	398	7494	4950	1167	0	6117	82	1823	419	2242	30
Kozelets	7216	2240	718	10174	6420	1665	0	8085	79	2356	630	2986	29
Chernihiv	7903	2935	1257	12095	7059	2178	0	9237	76	2536	744	3280	27
City Chernihiv	7194	1075	123	8392	6413	787	0	7200	86	2326	296	2622	31
TOTAL	46533	18741	10075	75349	41496	13782	0	55278	73	15013	4987	20000	27

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Distribution of selection 2 by dose intervals and raions

Raion	B 30-100 cGr	A 0-30 CGr	Total In selection 2
Ivankiv	940	146	1086
Chornobyl	723	337	1060
Polisya	675	296	971
Town Prypyat	655	320	975
Narodychi	461	669	1130
Ovruch	2518	1130	3648
Ripky	1823	419	2242
Kozelets	2356	630	2986
Chernihiv	2536	744	3280
City Chernihiv	2326	296	2622
Total	15013	4987	20000

Distribution of selection 2 (20000) by doses, gender, and year of birth

Year of birth	High dose		Middle dose			Low dose			All dose groups		
	M	F	M	F	not def	M	F	not def	M	F	not def
not defined	0	0	59	42	18	43	67	25	102	109	43
1982-86 (0-4)	0	0	561	598	262	805	888	545	1366	1486	807
1976-81 (5-10)	0	0	815	686	287	2086	2161	1041	2901	2847	1328
1972-75 (11-14)	0	0	535	462	162	2007	2191	869	2542	2653	1031
1968-71 (15-18)	0	0	249	199	52	830	1042	413	1079	1241	465
Summ	0	0	2219	1987	781	5771	6349	2893	7990	8336	3674
Total	0		4987			15013			20000		

7. Pathology support for diagnosis of various forms of thyroid pathology.

7.1. To continue collecting and pathological examination of morphologic material from all patients born in 1968 and later from cohort oblasts and having been operated at the Institute of Endocrinology for different thyroid diagnoses. Pathomorphologic analysis of collected material.

In order to provide to epidemiologists additional information on general cohort members concerning the possibility of surgical treatment for thyroid pathology before invitation for screening, collection of biopsy material has been continued in the form of paraffin blocks and histological preparations from patients born in 1968 and later, who reside in Kyiv oblast (including City of Kyiv), Chernihiv, Zhytomyr oblasts and have been operated during the reported period for different forms of thyroid pathology at the Clinic of the Institute of Endocrinology or in other clinics of Ukraine. In the latter case, paraffin blocks have been provided to the Laboratory for a consultative conclusion. For the period December 1999-February 2000, material has been collected from **37 cases of surgical thyroid pathology, among which 20 cases represented thyroid carcinoma** (3 from Kyiv oblast, 3 from Chernihiv oblast, 5 from Zhytomyr oblast, and 9 from the city of Kyiv); **5 cases represented a follicular adenoma** (one from Kyiv oblast, one from Zhytomyr oblast, and 3 from the city of Kyiv); **7 cases of nodular goiter** (2 from Kyiv oblast, 2 from Zhytomyr oblast, and 3 from the city of Kyiv); **3 cases of multinodular goiter** (one from Kyiv oblast, one from Zhytomyr oblast, and one from Chernihiv oblast); and **2 cases of diffuse toxic goiter** (one from Kyiv oblast and one from the city of Kyiv).

For diagnostic purpose, near 200 blocks have been embedded in paraffin, and more than 400 histological preparations studied at light microscope.

Among 20 studied cases of thyroid cancer 19 cases represented a papillary carcinoma, and one case a follicular carcinoma.

In turn, among papillary carcinomas 4 tumors were removed in children aged 12 (a girl born after the Chornobyl accident in 1987), 13 and 14 years (they were 3 to 11 months old at the time of the accident); 7 tumors in adolescents aged 15 (they were aged 2-4 years at the moment of the accident), and 8 tumors in young adult patients aged 21 to 29 (they were 8 to 17 years old at the time of the accident).

A follicular carcinoma has been reported in one young female aged 27.

As to their histological structure, papillary carcinomas in 6 cases (32 %) had a typical papillary structure; in 3 cases (16 %) a dominant follicular structure; in 5 cases (26%) a mostly solid structure; and in 5 cases (26 %) a mixed follicular-solid structure with papillary areas. Regional lymph node metastases of papillary carcinoma have been morphologically determined in 9 cases (47%). It should be stressed that in 2 cases the tumors were less than 1 cm (0,7-0,8 cm) in diameter, and there were no signs of tumor spreading within the gland or outside it.

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The follicular carcinoma represented an encapsulated tumor with a dominant microfollicular-solid structure, and was characterized by signs of invasive growth into tumor's capsule and blood vessels of the capsule.

Follicular adenomas were found only in one child aged 14, in one adolescent aged 15, and in 3 young adults aged 24, 27 and 30 years. These tumors were characterized by a dominant microfollicular-solid structure and signs of focal papillary hyperplasia. In one case most of adenoma surface underwent necrotic changes after a preoperative course of ethanol therapy, and in another case marked signs of hyalinosis have been reported.

Nodular solitary goiters have been found in one child aged 14; in 3 adolescents aged 16-17; and in 3 young adults aged 24, 27 and 30 years. Among them one goiter represented a necrotized nodule, the others had a heterogeneous structure with presence of cystic changes.

Diffuse toxic goiters have been removed in young females aged 21 and 23 years. They had a dominant normofollicular structure with signs of focal papillary hyperplasia.

7.2 Preparation of additional histological specimens for the morphologic data bank of the Ukr.-Am. Project (after identification of concrete patients included in the cohort).

A detailed information on the above cases, which included patient's passport data, place of residence during the accident and to date, as usual, has been provided to the Dosimetry Department of the Scientific Center of Radiation Medicine and to the DCC, in order to identify those persons who had direct measurements of thyroid activity and are included in the general cohort.

It has been established that among the subjects who have been operated within the reported period, **only one patient (female) evacuated from Prypyat, who have been identified in the process of screening examinations, belongs to the cohort** (see 7.3).

7.2. To ensure intraoperational diagnosis, histological processing and pathomorphologic analysis of specimens received from patients selected for surgery after screening. Preparation of additional histological specimens for the morphologic data bank of the Ukr.-Am. Project.

As a result of screening examinations performed, one patient (female) aged 21, evacuated from Prypyat (dose group "C", exposure dose 283,2 cGy), has been referred for surgery and operated on within the reported period.

An encapsulated papillary carcinoma of 0,8 cm in diameter with typical papillary structure has been verified in this patient (both by intraoperative and postoperative pathomorphologic study). No signs of tumoral spreading within the gland outside tumor's capsule have been noted.

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Additional histological specimens have been prepared from paraffin blocks of the tumor removed and extratumoral tissue for the morphologic data bank of the Ukr.-Am. Project, and for additional verification by the international Panel of experts-pathologists.

Besides, an additional thorough analysis of nodules removed in November 1999 in a girl-adolescent aged 15 (see previous report) has been made. According to cytologic signs of the nuclei of nodule cells, it has been decided to refer this case to follicular variant of papillary carcinoma.

Thus, to date, owing to active screening examinations, 13 thyroid carcinomas and 7 cases of benign thyroid pathology (5 follicular adenomas, one fibrotic nodule and one multinodular adenomatous oxyphilic-cell goiter) have been identified.

7.3. To fill in the Pathology Forms for the patients with revealed cases of thyroid pathology, included in the cohort under study.

Pathology Forms (Russian and English version) for the cases identified following screening examinations and operated on within the current quarter, have been filled in on paper.

Histological preparations for 6 cases of papillary carcinoma and 3 cases of benign thyroid pathology have been selected for additional verification by the experts-pathologists at the meetings of the Pathology Panel of the International Project for establishment of a tissue bank of post-Chornobyl tumors in Cambridge on March 4-5, 2000.

**DOSIMETRY SUPPORT OF THE UKRAINE-US “SCIENTIFIC PROTOCOL FOR
THE STUDY OF THYROID CANCER AND OTHER THYROID DISORDERS IN
UKRAINE FOLLOWING THE CHORNOBYL ACCIDENT”**

(3rd quarter report, Parts 8.7, 8.28, 8.29, 8.30, 8.31)

1999-2000

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8.7. PERSONAL QUESTIONING OF COHORT MEMBERS IN THE PROCESS OF SCREENING. DOSIMETRY SUPPORT OF MEDICAL INVESTIGATIONS. EXPANSION AND SUPPORT OF PERSONAL QUESTIONNAIRE DB FOR COHORT MEMBERS

Throughout the third quarter of investigation 1999-2000 (period from December 1999 to February 2000) collection of dosimetry questionnaires continued as mobile teams pursued their work and in the process of examination of cohort members at the Institute of Endocrinology and Metabolism. A total of 962 questionnaires have been collected from 01.12.1999 till 26.02.2000, among which 634 (66%) have been entered into computer database. An addition, 269 questionnaires have been entered into computer database from 898 collected in previous period (from September 1999 to November 1999).

Table 8.7.1 gives distribution of questionnaires collected in the last quarter and entered into computer DB according to the age of cohort members at the moment of the accident and raions of residence during the accident.

Table 8.7.1 By-age and by-raion distribution of personal questionnaires collected in the 3rd quarter

Raion	Age, years				Total
	0-4	5-9	10-14	15-18	
Narodychi	25	50	43	19	137
Ovruch	17	42	67	12	138
Ivankiv	14	16	31	13	74
Polisya	1	7	11	4	23
Chornobyl	10	13	20	6	49
Prypyat'	13	18	6	7	44
Kozelets	35	31	29	11	106
Ripky	0	0	1	0	1
Chernihiv raion	18	18	16	2	54
City of Chernihiv	1	2	3	0	6
Vasilkov town	0	1	0	0	1
Kyiv	0	0	0	1	1
Total	134	198	227	75	634

Table 8.7.2 gives distribution of collected questionnaires by raions of residence at iodine stage of the accident and by dose groups.

Table 8.7.2 By-dose and by-raion distribution of personal questionnaires collected in the 3rd quarter

Raion	Dose groups			Total
	A	B	C	
Narodychi	9	28	100	137
Ovruch	34	53	51	138
Ivankiv	29	23	22	74
Polisya	3	5	15	23
Chornobyl	9	17	23	49
Prypyat	11	9	24	44
Kozelets	61	30	15	106
Ripky	0	1	0	1
Chernihiv raion	4	10	40	54
City of Chernihiv	5	1	0	6
Vasilkov town	0	0	1	1
Kyiv	0	0	1	1
Total	165	177	292	634

It has been found out during the process of interviewing that the location of one person (ID 03290620) at the moment of the accident was the city of Kyiv, and not the Prypyat town as it was denoted in dosimetric DB. Other subject (ID 09638531) according to the interview was at Vasilkov town (Vasilkov raion, Kyiv oblast) at the time of the accident, and not at Maksimovichy village (Polisya raion) as it was noted in dosimetric DB. Epidemiologists should resolve the issue of whether to left or not this person in the cohort.

8.28. ANALYSIS OF THE ANSWERS RECEIVED IN THE PROCESS OF QUESTIONING

8.28.3. Comparison of the answers of evacuees from the town of Prypyat received in 1988-1989 and in 1998-1999

8.28.3.1. Description of the files of questionnaire data being compared

The analysis of personal questionnaire information has been continued. A comparative analysis has been made of the answers of subjects in questionnaires collected in 1988-89, and in questionnaires collected in 1998-99 among cohort members evacuees from the town of Prypyat. In 1988-89 Dr. V.V. Chumak with collaborators conducted a mass questioning of inhabitants evacuated from the town of Prypyat in order to reconstruct the doses of external exposure received by these persons and to estimate the protective measures organized before the evacuation of inhabitants. A total of 10073 inhabitants of Prypyat, mainly adults ones, have been questioned. Information from questionnaires on paper has been entered by collaborators of Dr. V.V. Chumak into a computer file. In 1992 the computer file with information from these questionnaires (10073 records) has been provided to our Laboratory and used for linkage with iodine computer database. The same file has been used at present to establish computer linkage of Project questionnaires (4636 questionnaires) and questionnaires collected in former inhabitants of the town of Prypyat (10073 questionnaires). In order to establish linkage between the Tables, fields containing the following information have been used:

- 1) Last name, first name, patronymic
- 2) Year of birth
- 3) Settlement of residence at the moment of the accident (town of Prypyat)

A total of 132 records have been found linked.

The structure of questionnaires for the inhabitants of the town of Prypyat, which have been used in 1988-1989 for reconstruction of doses of external exposure, is given on Fig. 8.28.3.1.1. This structure significantly differed from that of the questionnaire for Thyroid Project. Thyroid Project questionnaire contains much more information positions for a detailed description of the

1. Фамилия, имя, отчество Владимировна

2. Год рождения 87

3. Род занятий (профессия) до аварии н/о
для детей - школа № д/с № (в г. Припять)

4. Адрес места жительства в г. Припять ук.

5. В каком секторе (по прилагаемой схеме) находится Ваш дом в г. Припять 3

6. Адрес нового места жительства Х.

7. Вид дома в г. Припять: многоэтажный (какой этаж 1); частный (каменный или деревянный?) -
(нужное подчеркнуть)

8. Находились ли Вы в момент аварии в городе или за городом (указать место в городе
дома)

9. Если Вы были дома, то были ли открыты окна? Когда? В течение какого времени? 26 апреля
открыты, 27 апреля открыты.

10. Когда вы узнали об аварии? 27 апреля в 4/10 часов

11. Принимались ли таблетки (препараты йода)? нет Когда? Сколько раз? -
26 апреля нет 27 апреля нет.

12. Принимались ли иные меры предосторожности: влажная уборка, мытье, смена одежды, ограни-
чение выходов на улицу, герметизация помещений (нужное подчеркнуть), другие (указать) ни каких мер предосторожности

13. Попробуйте вспомнить свое местонахождение по часам от момента начала аварии до момента
эвакуации. Правила заполнения таблицы таковы: в графах проставьте НОМЕР СЕКТОРА по
прилагаемой схеме, соответствующего Вашему местоположению в данный час с учетом нахож-
дения внутри и вне помещения.

часы	:	2:	3:	4:	5:	6:	7:	8:	9:	10:	11:	12:
в помещении	:	3:	3:	3:	3:	3:	3:	5:	5:	:	:	:
на улице	:	:	:	:	:	:	5:	:	:	5:	6:	:

26 апреля

часы	: 2: 3: 4: 5: 6: 7: 8: 9: 10: 11: 12: 13: 14: 15: 16: 17: 18: 19: 20: 21: 22: 23: 24:
в помещении	: 3: 3: 3: 3: 3: 3: 3: 3: : : : : : : 3: 3: : : : : 3: 3: 3:
на улице	: : : : : : : : 4: 4: 7: 7: 7: 4: : : 3: 3: 4: 5: : : :

27 апреля

часы	: 2: 3: 4: 5: 6: 7: 8: 9: 10: 11: 12: 13: 14: 15: 16: 17: 18: 19: 20: 21: 22: 23: 24:
в помещении	: 3: 3: 3: 3: 3: 3: : : : : : : : : : : : : :
на улице	: : : : : : : 3: 3: 3: 7: 8: 5: 5: 3: 3: : : : : : : :

Figure 8.28.3.1.1., List 1. Questionnaire 1988-89

15. Когда и как Вы покинули г. Припять? Куда Вы выехали после эвакуации?
Сколько времени там находились?

При эвакуации? Из Припяти, автобусом
уезжал С. Красовичи Точковского р-на.
находясь с 29.05.86 по 16.06.86г.
с 16.06.86 по 3.09.86г. н/д. Личная сказка
Волосаковского р-на.

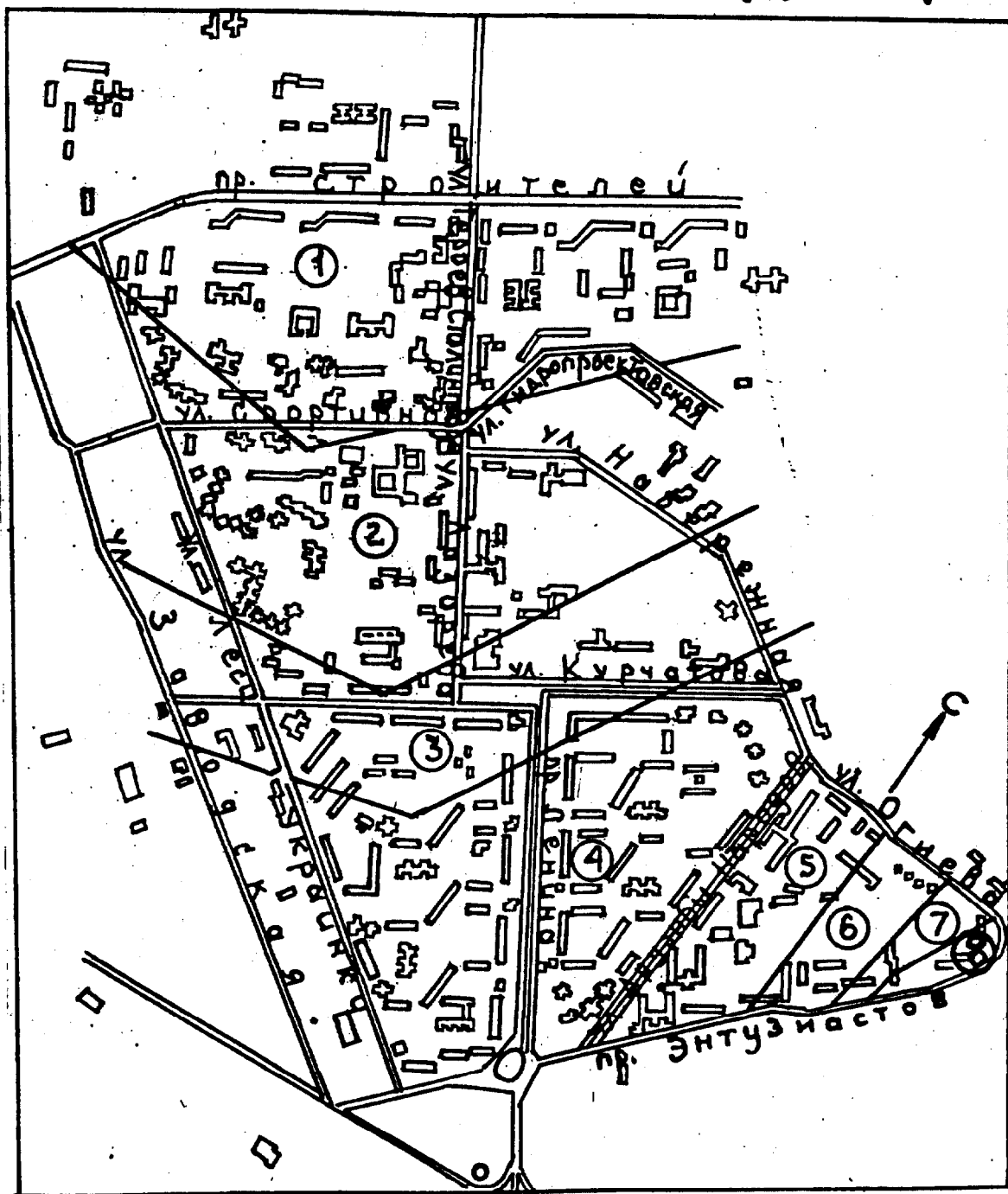


Figure 8.28.3.1.1., List 2. Questionnaire 1988-89 continued.

regimen of behavior and food consumption in iodine period of the Chernobyl accident as compared to the questionnaire of 1988-89. In this connection, there is a possibility of comparing information only for two information blocks:

- 1) Taking stable iodine
- 2) Movings in iodine period of the accident.

8.28.3.2. Comparison of information on taking stable iodine

It should be also stressed that questionnaires for 1988-89 provide information on taking of stable iodine only on the days before organized evacuation from Prypyat: for April 26 and 27, 1986. These questionnaires do not contain information on stable iodine takings on subsequent days. Therefore, a comparison of information on taking stable iodine may be made only for April 26 and 27 on a sample of 132 linked questionnaires.

Table 8.28.3.2.1 gives the distribution of questionnaires collected in 1988-89 concerning the fact of taking stable iodine in a 2-day period: April 26 - 27, 1986.

Table 8.28.3.2.1. Distribution of questionnaires of 1988-89 concerning the fact of taking stable iodine

Number of questionnaires with mention of stable iodine taking	Number of questionnaires without mention of stable iodine taking	Total
83	49	132

Table 8.28.3.2.2 provides information on the distribution of questionnaires of Thyroid Project concerning the fact of taking stable iodine only for those individuals for which the questionnaires of 1988-89 had a mention of taking stable iodine for the period April 26-27, 1986.

Table 8.28.3.2.2. Distribution of Project questionnaires concerning the fact of taking stable iodine for those individuals for which in the questionnaires of 1988-89 there was a mention of taking stable iodine

Taking in the period 26.04- 27.04.1986		No taking on 26- 27.04, but taking is mentioned for 28- 30.04.1986		No taking on 26- 30.04.1986		Total Number
Number	%	Number	%	Number	%	
50	60	5	6	28	34	83

Table 8.28.3.2.3 provides information on the distribution of Project questionnaires concerning the fact of taking stable iodine only for those individuals for which in the questionnaires of 1988-89 there was no mention of stable iodine taking

Table 8.28.3.2.3. Distribution of questionnaires of Thyroid Project concerning the fact of taking stable iodine for those individuals for which in the questionnaires of 1988-89 there was no mention of taking stable iodine

The fact of taking is not mentioned for the period 26.04-27.04.1986		The fact of taking is mentioned for the period 26.04-27.04. 1986		Total Number
Number	%	Number	%	
36	73	13	27	49

Thus, the rate of reproducibility of information on the fact of taking stable iodine in questionnaires of children and adolescents evacuated from the town of Prypyat is equal to:
 $(50+36)/(83+49) \approx 65\%$

8.28.3.3. Comparison of information on movings during iodine period of the accident

It was impossible to make a comparison of information on movings of evacuees from Prypyat in questionnaires of 1988-89 and questionnaires of 1998-99 on the base of computer file of questionnaires of 1988-89 only. This file contained information only on one (very rarely on two) settlement(s) where the subject was after evacuation. In questionnaires of 1998-99 as a rule, several settlements on average were indicated for the inhabitants of the town of Prypyat after evacuation in iodine period of the accident. It turned out that since the aim of questioning in 1988-89 was to reconstruct external exposure dose received in the town of Prypyat, a detailed information on places of relocation after evacuation was not entered into computer file. Only that settlement was included where the evacuee stayed for a long time.

Therefore, it was necessary to conduct a search of primary questionnaires of 1988-89 on paper in order to perform additional entry of missing data on movings. The collaborators of the Laboratory of Dr. V.V. Chumak, where the originals of primary questionnaires are stored, helped us in searching. Nevertheless, we managed to find questionnaires on paper only for 60 out of 133 records in computer DB (it is possible that part of primary questionnaires of 1988-89 on paper has been lost). Information from the questionnaires searched out has been entered into

computer file, and subsequent analysis was performed on 60 couples of questionnaires being compared.

Besides, it turned out that the questionnaires of 1988-89 do not contain in all cases information on movings within the whole iodine period of the accident. In some cases, there is information on movings only for the first part of this period, for example, only until middle of May or first days of May. In this connection, an analysis of reproducibility of data on residential location in iodine period of the accident was made for each couple of linked questionnaires for a different period of time: only for the period for which the settlements of residence in both questionnaires of the couple being compared are known.

Let us consider the i -th couple of linked questionnaires. Let t_i denote the duration of period for which information on settlement of residence for each of the two questionnaires of i -th couple is known. Let a_{ik} denote the settlement which is indicated in Project questionnaire (questionnaire of 1998-99) in the i -th couple of linked questionnaires for the k -th day of iodine period. Respectively, let b_{ik} denote the settlement which is indicated in the questionnaire of 1988-89 in i -th couple of linked questionnaires for the k -th day of iodine period. Let N denote the total number of linked questionnaires. For the i -th couple of linked questionnaires the value of k can not exceed the value t_i . Let introduce the function:

$$equ(a_{ik}, b_{ik}) = \begin{cases} 1, & a_{ik}=b_{ik} \\ 0, & a_{ik} \neq b_{ik} \end{cases} \quad (1)$$

In order to estimate the quality of reproducibility of information on movings in iodine period of the accident, let us calculate the value P :

$$P = \frac{1}{N} \times \sum_{i=1}^N \frac{\sum_{k=1}^{t_i} equ(a_{ik}, b_{ik})}{t_i} \times 100\% \quad (2)$$

The value P is the rate (in per cent) of information reproducibility. Primordially, we suppose information on residential location in questionnaires of 1988-89 to be more trustworthy, and

information reproducibility in questionnaires of 1998-99 (Project questionnaires) is meant as compared with information from questionnaires of 1988-89.

We have obtained a value of $P \approx 47\%$.

Such a small value of information reproducibility rate may be due to the following reasons.

First, the years elapsed after the first questioning. Time erases from memory the details and peculiarities of behavior during the first month after the accident.

Secondly, it should be noted for the inhabitants of the town of Prypyat in most cases a tendency to often change their settlements of residence after evacuation. So, a person might change his settlement 3-4 times on average during iodine period of the accident. In the presence of such a frequency of movings, the subject may remember all the settlements but may be mistaken about the dates of relocation. Errors in dates are increasing with time elapsed after the accident, and this influences the rate of information reproducibility in questionnaires of 1998-99 as compared to those of 1988-89.

8.29. INTERCOMPARISON EXERCISE: ANALYSIS OF SENSITIVITY OF DOSIMETRIC MODEL TO INPUT PARAMETERS

8.29.5. Foreword

Calculation of individual dose estimates consists of two stages:

- 1) estimation of the activity of thyroid content of ^{131}I at the moment of measurement;
- 2) calculation of thyroid exposure dose of ^{131}I for a concrete subject on the base of estimation of activity in a supposed model of function of thyroid content of activity.

At each of these stages, heterogeneous data are being used, which differ by a number of criteria (time and place of obtaining data, source, accuracy characteristics, etc.). So, if activity estimation is based on information about time, place and conditions of measurement for a concrete subject, and uncertainties of this estimation are mainly determined by instrumental indicators, dose calculations are grounded both on individual information (sources: measurement protocols and questionnaire) and on a large file of radioecological information (information on dynamics and intensity of radioactive contamination of a fixed settlement, information on behavior of a concrete nuclide in environment and human body). Thus, dosimetric model calculations use a vector of parameters of large dimensions. In addition, their uncertainty does not only consist in uncertainty in parameter values, but may also include a part connected with a possible model inadequacy. All this justifies a separate analysis of sensitivity of the model of thyroid activity estimation and the model proper of dose calculations.

In the first case, for activity estimation, based on analytic expression of estimate, a rated contribution of particular parameters into total variance of activity estimation has been calculated. In the second case, for individual dosimetric models, the relationship between estimates and key indicators contained in a questionnaire, is under study. In this case, the problem of model's adequacy is not considered.

8.29.6. Analysis of Sensitivity of the activity estimation model

The model used for activity calculation according to the data of scenarios has been described in previous report [2nd quarter report 1999-2000, Part 8.29]. Modelling of distribution of activity estimation was performed according to the following formula:

$$A \text{ (kBq)} = 37 K_s \frac{K_{ov}(a)}{K_m(a)} \left\{ (N_{th} + K_{er_th}) - (N_{ab} + K_{er_ab}) \frac{[k_1 + r(t,w)]}{[r(t,w) + 1]} - (N_{bg} + K_{er_bg}) \frac{k_2(a)(1 - k_1)}{[r(t,w) + 1]} \right\} \quad (1)$$

where

- A = Thyroid activity on the day of counting, kBq;
- K_s = Calibration factor of SRP-68-01 according to control source (bottle phantom of thyroid /mass = 10 g/ without tegumental tissues), in $\mu\text{Ci } \mu\text{R}^{-1} \text{ h}$;
- $K_{ov}(a)$ = Age-related correction factor for taking into account gamma radiation absorption by the layer of tissues covering the thyroid, dimensionless;
- $K_m(a)$ = Age-related correction factor for taking into account self-absorption of radiation in the thyroid, dimensionless;
- 37 = Factor for conversion activity from μCi into kBq;
- $k_2(a)$ = Age-related factor of shielding of γ -radiation by human body at the place of counting;
- k_1 = Factor taking into account the geometrical relationships when counting caesium radionuclides in the body on thyroid and abdomen levels;
- N_{th} = Counting rate of γ -radiation when counting on thyroid level, $\mu\text{R h}^{-1}$;
- N_{ab} = Counting rate of γ -radiation when counting on abdomen level, $\mu\text{R h}^{-1}$;
- N_{bg} = Counting rate of γ -radiation at the place of counting in the absence of the patient, $\mu\text{R h}^{-1}$;
- $r(t,w)$ = Relationship between superficial contamination and radiocaesium content in the body when counting on abdomen level (depends on time elapsed from the 26.04.86 till the date of counting and on information about washing before counting), dimensionless;
- a = Subject's age at the moment of counting, years.

A differential approach to the analysis of the influence of individual parameters on general uncertainty has been applied to (1). Table 8.29.6.1 and 8.29.6.2 gives the parameters of a distribution of activity estimates modelled according to Monte Carlo method, and rated contribution into observed uncertainty of activity estimates of each of variables for two cases: absence of calibration of the SRP device in the process of measurement ("worst case"), and calibration of the SRP device in the process of measurement ("best case").

Table 8.29.6.1. Parameters of a distribution of activity estimates and rated contribution of the particular parameters into variance of dose estimate for the “worst” case (common calibration factor for all SRP-68-01 devices)

Subject	SN Ratio	Parameters of activity estimation				Contribution to the variance of activity estimate, %											
		GM	GSD	Ln(GM)	Ln(GSD)	Km	Kov	Ks	k1	k2	Nth	Nthe	Nab	Nabe	Nbg	Nbge	Rtw
A	9.2	374	1.24	5.92	0.219	5.8	6.1	87.9	0.0	0	0.1	0.1	0.0	0.0	0	0	0.0
B	3.1	90	1.25	4.50	0.223	7.0	6.1	86.1	0.0	0	0.3	0.2	0.1	0.0	0	0	0.2
C	1.4	30	1.26	3.40	0.233	5.0	5.1	73.6	0.8	0	1.5	1.4	0.9	1.1	0	0	10.6
D	5.2	247	1.25	5.51	0.223	7.1	6.1	86.4	0.0	0	0.1	0.2	0.0	0.0	0	0	0.1
E	23.6	377	1.25	5.93	0.226	7.0	5.6	87.3	0.0	0	0.1	0.1	0.0	0.0	0	0	0.0
V	1.3	29	1.27	3.38	0.241	4.6	4.7	68.7	1.9	0	1.5	1.3	0.9	1.1	0	0	15.4
W	27.5	321	1.25	5.77	0.224	5.8	5.9	88.2	0.0	0	0.1	0.1	0.0	0.0	0	0	0.0
X	1.2	16	1.31	2.78	0.268	3.5	3.6	53.9	1.8	0	3.1	3.9	2.1	3.2	0	0	24.9
Y	2.8	54	1.25	4.00	0.222	6.0	5.9	86.1	0.0	0	0.5	0.5	0.2	0.0	0	0	0.7
Z	1.5	13	1.26	2.53	0.231	6.5	5.2	75.0	0.2	0	4.5	0.7	2.9	0.7	0	0	4.5

Table 8.29.6.2. Parameters of a distribution of activity estimates and rated contribution of the particular parameters into variance of dose estimate for the “best” case (calibration of SRP device in the process of measurement)

Subject	SN Ratio	Parameters of activity estimation					Contribution to the variance of activity estimate, %										
		GM	GSD	Ln(GM)	ln(GSD)	Km	Kov	Ks	K1	K2	Nth	Nthe	Nab	Nabe	Nbg	Nbge	Rtw
A	9.2	380	1.10	5.941	0.0939	36.4	36.5	26.0	0.0	0.0	0.3	0.4	0.0	0.1	0.0	0.0	0.3
B	3.1	91	1.10	4.513	0.0975	39.2	32.1	24.2	0.0	0.0	1.8	1.2	0.6	0.1	0.0	0.0	0.8
C	1.4	30	1.13	3.416	0.1230	15.3	15.8	11.0	2.9	0.0	4.8	4.5	2.9	3.9	0.0	0.0	38.8
D	5.2	252	1.10	5.530	0.0965	40.8	33.0	23.8	0.0	0.0	0.5	1.0	0.1	0.2	0.0	0.0	0.6
E	23.6	387	1.10	5.958	0.0954	41.0	34.0	24.2	0.0	0.0	0.3	0.5	0.0	0.0	0.0	0.0	0.0
V	1.3	30	1.14	3.402	0.1345	14.0	14.5	10.3	5.9	0.0	4.5	3.9	2.7	3.1	0.0	0.0	41.2
W	27.5	327	1.10	5.789	0.0941	35.8	37.2	26.1	0.0	0.0	0.4	0.5	0.0	0.0	0.0	0.0	0.0
X	1.2	16	1.19	2.800	0.1734	7.6	7.5	5.4	4.1	0.0	6.4	7.9	4.4	6.6	0.0	0.0	50.0
Y	2.8	55	1.10	4.015	0.0973	32.6	32.9	24.4	0.2	0.0	2.8	2.8	0.9	0.2	0.0	0.0	3.3
Z	1.5	13	1.13	2.548	0.1252	24.9	20.6	15.2	0.5	0.0	14.6	2.3	9.1	2.1	0.0	0.0	10.9

It follows from the above Tables that in the “worst case” total uncertainty in calibration factors (K_m, K_s, K_{ov}) ensures 65-99% of variance of activity estimation; parameters k_1 and k_2 give a contribution not exceeding 2 % ; the indicators being measured, taking into account reading errors ($N_{th}, N_{ab}, N_{bg}, K_{er_{th}}, K_{er_{ab}}, K_{er_{bg}}$) explain 0.5-12% of variance. The factor of body washing (washing factor) may increase the variance from 0.1 to 25%. The corresponding indicators for the “best case” are as follows: 30-98% - contribution of calibration factors; up to 6% - contribution of parameters k_1 and k_2 ; 1-30% - contribution of parameters being measured. The share of variance brought by the washing factor may reach 50%.

As is generally known, signal/noise ratio represents an informative indicator for a quantitative description of uncertainty of the result in measuring systems. When measuring γ -radiation count from ^{131}I incorporated into the thyroid, γ -radiation due to superficial contamination and radiocesium incorporated into the body, represent the noise. The following formula serves as a simplified expression for signal/noise ratio in our scheme:

$$SNR = \frac{N_{th}}{N_{ab}} - 1 \quad (2)$$

where

$$\begin{aligned} N_{th} &= \gamma\text{-radiation counting rate when measuring on thyroid level, } \mu\text{R h}^{-1}; \\ N_{ab} &= \gamma\text{-radiation counting rate when measuring on abdomen level, } \mu\text{R h}^{-1}; \end{aligned}$$

Fig. 8.29.6.1. represents the relationship between $\log(\text{GSD})$ of activity estimates and signal/noise ratio SNR calculated by (2). As it follows from this Figure, for values of SNR near 0, we have a maximal uncertainty of activity estimates. At the same time, $\log(\text{GSD})$ monotonously decreases with increasing SNR , what points out the natural properties of our model of measurements. Tables 8.29.6.1 and 8.29.6.2 show that the washing factor makes an important contribution into the uncertainty of activity estimation in the presence of small values of SNR .

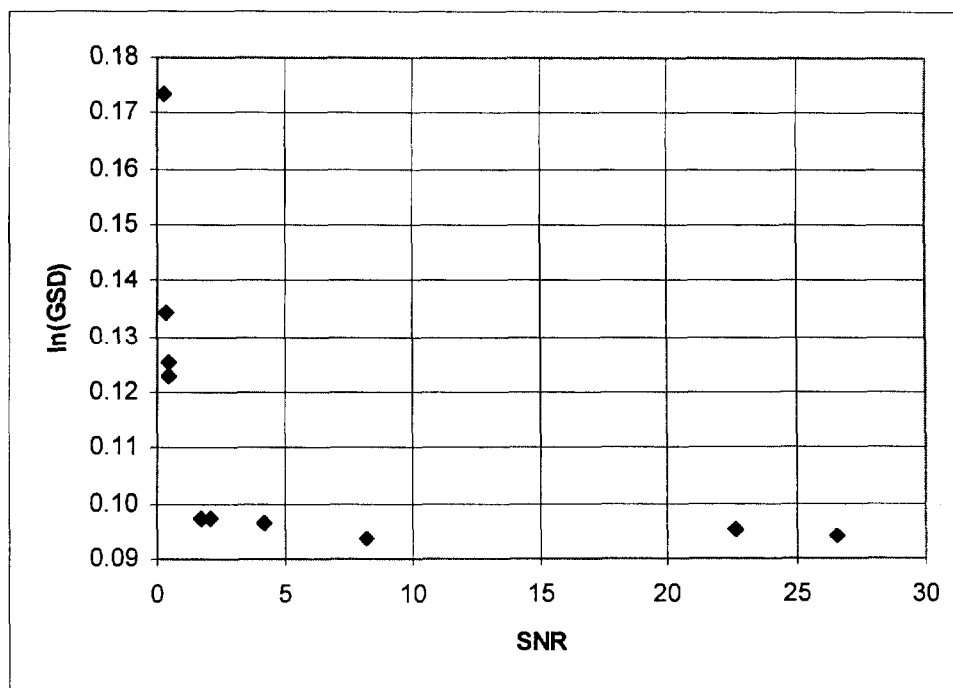


Fig. 8.29.6.1. Relationship between uncertainty of activity estimates and signal/noise ratio for the “best” case.

8.29.7 Analysis of sensitivity of thyroid exposure dose estimates

At a previous stage, distributions of dose estimates of subjects have been obtained using Monte Carlo approach taking into account the distributions of 26 model parameters (21)-(42) [2nd quarter report 1999-2000, Part 8.29]. Table 8.29.7.1 gives for each of the subjects the parameters of distributions of dose estimates and the value of signal/noise ratio according to the scenarios considered. The relationship between GSD and indicator SNR is reflected on Fig. 8.29.7.1. It follows from the Fig. 8.29.7.1 that for small values of SNR (within the interval [0;1]) GSD is increasing and may reach the value 1.9-2, while with increasing SNR GSD value fluctuates on the level 1.5 (in this case uncertainty is determined by other factors). This points out the important contribution of variance of activity measurement into the uncertainty of dose estimate.

Table 8.29.7.1. Parameters of distribution of thyroid exposure dose estimate from ^{131}I

Subject	SN Ratio, Relative units	Parameters of distribution for Dose estimate			
		The worst case ^a		The best case ^b	
		GM dose, mGy	GSD	GM dose, mGy	GSD
A	8.2	1732.0	1.547	1737.0	1.507
B	2.1	624.6	1.554	608.0	1.504
C	0.4	6767.8	1.643	6823.2	1.544
D	4.2	678.2	1.581	688.3	1.497
E	22.6	220.9	1.578	216.4	1.497
V	0.3	12317.0	1.810	12931.5	1.768
W	26.5	1816.1	1.539	1754.3	1.489
X	0.2	2578.1	1.639	2689.9	1.567
Y	1.8	1607.9	1.569	1630.5	1.493
Z	0.5	935.7	1.576	958.3	1.516

^a **The worst case** - the lack of the results of calibration for the specific SRP-68-01 device, which was used in measurements

^b **The best case** -specific SRP-68-01 device was calibrated during the measurements

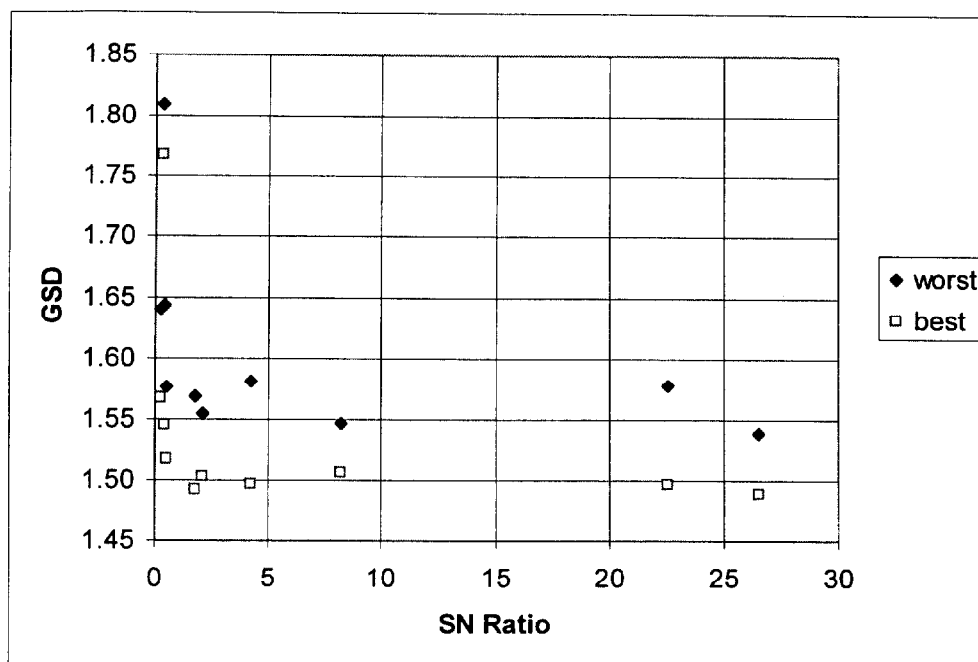


Fig. 8.29.7.1. The relationship between GSD of dose estimates and the signal/noise ratio (SNR) for the “best” and “worst” case

In order to study the influence, on dose estimation, of key indicators obtained from questionnaires, for a number of subjects (A, C, E, Y) the dose was tabulated as a function of a concrete parameter. Tables 8.29.7.2–8.29.7.4 give the dose estimates and rated contribution of three main factors of ^{131}I dose formation for selected subjects as a function of levels of milk, leafy vegetable consumption, and day of beginning of cattle grazing.

In order to compare the effect in different subjects, the relationship is analysed between the relative dose expressed in percent to the dose in case of zero value of the parameter considered (zero consumption of milk, leafy vegetables, etc.). The relative dose as a function of level of milk, leafy vegetables consumption, and day of beginning of cattle grazing for selected subjects is reflected on Fig. 8.29.7.2–8.29.7.4.

Table 8.29.7.2 and Fig. 8.29.7.2 show that dose estimates as a function of consumption level have a peculiarity near zero. This means that in the region of small values of the argument insignificant changes may lead to important changes in dose estimate. Milk consumption over 0.5 L/day does not practically change dose estimates. One may conclude that even consumption of a minimal amount of milk or dairy products (milk soup, milk porridge) may play an important role in persons who declare they did not consume milk. Such information may modify the dose estimates by 2-3 times (subject C).

Similarly, greens consumption level has the strongest influence on low levels (up to 0.1 kg/day), and may lead to a modification of dose estimate by 10-15% (Table 8.29.7.3 and Fig. 8.29.7.3).

A change of the day of beginning of cattle grazing up to 15 days may decrease the dose by 20-60% as compared to the dose in case of grazing beginning on day 0 (Table 8.29.7.4 and Fig. 8.29.7.4).

The influence of milk source on individual dose estimates is analyzed by comparison of doses calculated for all 10 subjects, supposing three milk sources (private cow's milk, milk from trading network, further called store milk, and goat's milk).

Table 8.29.7.2 Estimate of ^{131}I thyroid exposure dose and its components as functions of daily milk consumption rate

		Subject A				Subject C				Subject Y				Subject E			
		Dose, mGy	Inhalatio n,%	leafy veget., %	Milk, (%)	Dose, mGy	inhalatio n,(%)	leafy veget., %	milk, (%)	Dose, mGy	inhalatio n,%	Leafy veget. , %	milk , %	Dose, mGy	Inhalatio n,%	Leafy veget. , %	milk , %
1	0	1877	11.3	88.7	0.0	20886	100.0	0.0	0.0	2092	18.1	81.9	0.0	257	11.5	88.5	0.0
2	0.05	1799	8.1	63.9	28.0	7020	15.4	0.0	84.6	1701	13.3	60.0	26.8	251	10.6	81.6	7.8
3	0.1	1758	6.3	49.9	43.7	6652	8.3	0.0	91.7	1535	10.5	47.3	42.2	246	9.8	75.8	14.4
4	0.2	1716	4.4	34.7	60.9	6461	4.3	0.0	95.7	1385	7.4	33.3	59.4	238	8.6	66.2	25.2
5	0.5	1672	2.3	18.2	79.5	6330	1.5	0.0	98.5	1248	3.9	17.6	78.5	225	6.2	48.1	45.7
6	0.8	1656	1.6	12.3	86.1	6314	1.1	0.0	98.9	1206	2.6	12.0	85.4	218	4.9	37.7	57.4
7	1	1651	1.3	10.1	88.6	6304	0.9	0.0	99.1	1191	2.2	9.9	88.0	215	4.3	33.0	62.7
8	2	1639	0.7	5.4	94.0	6284	0.5	0.0	99.5	1159	1.2	5.2	93.6	208	2.6	20.3	77.1
9	3	1635	0.5	3.6	95.9	6278	0.3	0.0	99.7	1148	0.8	3.6	95.6	205	1.9	14.6	83.5
10	5	1631	0.3	2.2	97.5	6272	0.2	0.0	99.8	1138	0.5	2.2	97.3	202	1.2	9.4	89.4

Table 8.29.7.3 Estimate of ^{131}I thyroid exposure dose and its components as functions of leafy vegetable daily consumption rate

Id	Subject A				Subject C				Subject Y				Subject E			
	Dose, mGy	Inhalation, %	leafy veget., %	milk, (%)	Dose, mGy	inhalation, (%)	leafy veget., %	milk, (%)	Dose, mGy	inhalation, %	leafy veget., %	milk, %	Dose, mGy	Inhalation, %	leafy veget., %	milk, %
1	0.000	1.8	0.0	98.2	6330	1.5	0.0	98.5	1506	4.3	0.0	95.8	200	3.3	0.0	96.7
2	0.002	1.8	1.3	96.9	6341	1.5	1.8	96.8	1514	4.2	2.2	93.6	200	3.3	0.9	95.9
3	0.010	1.7	6.3	92.1	6379	1.4	8.3	90.3	1542	3.8	10.2	86.0	202	3.2	4.2	92.6
4	0.020	1.6	11.8	86.7	6421	1.3	15.3	83.4	1572	3.5	18.4	78.1	203	3.0	8.1	88.9
5	0.050	1.3	25.0	73.6	6518	1.0	31.2	67.8	1642	2.7	36.1	61.2	207	2.7	18.0	79.3
6	0.100	1.1	40.0	58.9	6621	0.8	47.6	51.7	1715	2.0	53.1	45.0	212	2.3	30.5	67.2
7	0.200	0.8	57.2	42.1	6731	0.5	64.5	35.0	1791	1.3	69.3	29.4	219	1.8	46.7	51.5
8	0.500	0.4	76.9	22.6	6849	0.3	81.9	17.8	1871	0.6	85.0	14.4	229	1.0	68.7	30.3
9	1.000	0.2	87.0	12.8	6905	0.1	90.1	9.8	1909	0.3	91.9	7.8	236	0.6	81.4	18.0
10	2.000	0.1	93.0	6.8	6938	0.1	94.8	5.1	1931	0.2	95.8	4.1	240	0.3	89.8	9.9

Table 8.29.7.4 Estimate of ^{131}I thyroid exposure dose and its components as functions of the day of beginning of cattle grazing.

Id	Day of start cattle grazing	Subject A				Subject C				Subject Y				Subject E			
		Dose, mGy	Inhalation, %	leafy veget., %	milk, %	Dose, mGy	Inhalation, %	leafy veget., %	milk, %	Dose, mGy	Inhalation, %	leafy veget., %	Milk, %	Dose, mGy	Inhalation, %	leafy veget., %	Milk, %
1	0	1657	1.6	12.3	86.1	6330	1.5	0.0	98.5	1766	2.5	11.3	86.1	235	1.8	13.7	84.5
2	1	1657	1.6	12.3	86.1	6330	1.5	0.0	98.5	1766	2.5	11.3	86.1	235	1.8	13.7	84.5
3	2	1601	1.7	13.1	85.2	6330	1.5	0.0	98.5	1747	2.6	11.7	85.8	228	1.9	14.8	83.3
4	4	1413	2.1	16.9	81.0	6160	1.6	0.0	98.4	1564	3.6	16.1	80.3	208	2.6	20.3	77.1
5	6	1275	2.7	21.5	75.8	5094	2.1	0.0	97.9	1344	6.0	27.2	66.8	194	3.6	27.8	68.6
6	8	1182	3.4	26.8	69.8	4082	3.0	0.0	97.0	1213	9.3	42.0	48.7	188	5.0	38.4	56.7
7	10	1131	4.2	32.8	63.0	3252	4.3	0.0	95.7	1216	11.2	50.7	38.1	193	6.9	53.1	40.0
8	15	1210	6.3	49.4	44.3	2184	8.5	0.0	91.5	1428	15.5	70.1	14.3	257	11.5	88.5	0.0

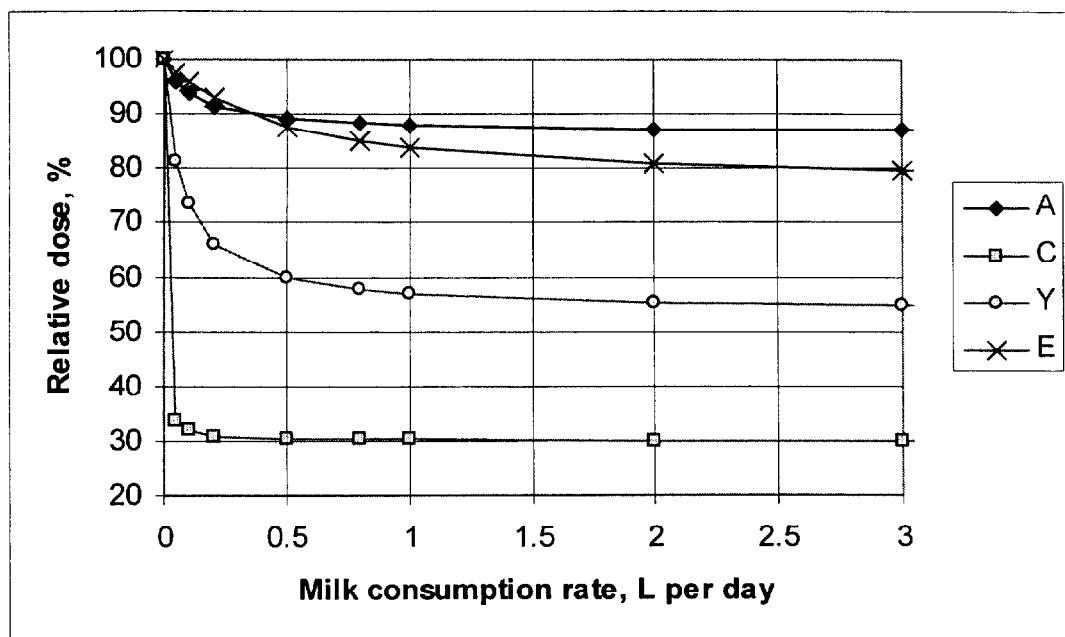


Fig. 8.29.7.2. Subject's relative dose as a function of daily milk consumption rate.

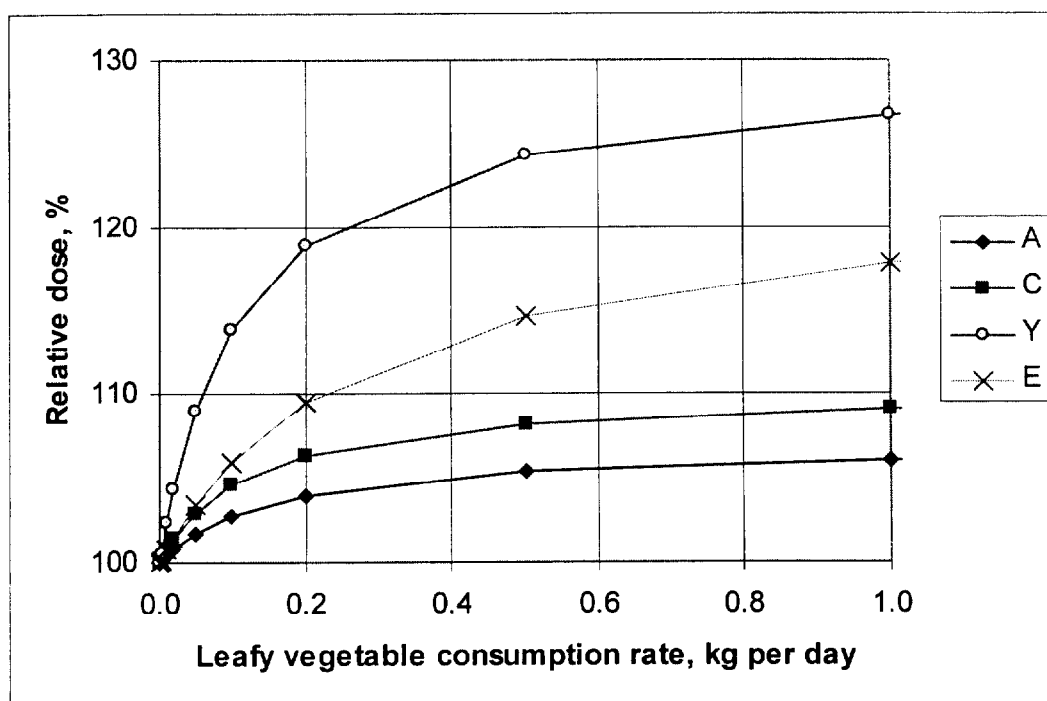


Fig. 8.29.7.3. Subject's relative dose as a function of leafy vegetable daily consumption rate .

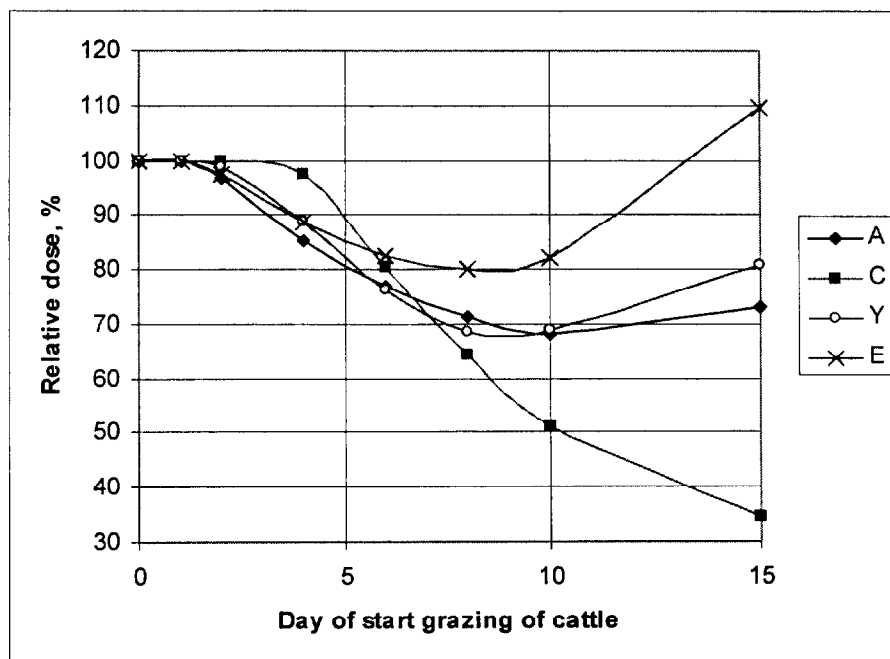


Fig. 8.29.7.4. Subject's relative doses as function of the day of of beginning of cattle grazing (for subjects A,C,Y,E)

The values of absolute and relative doses are given in Table 8.29.7.5 (a dose supposing consumption of private cow's milk is chosen as a basic dose for calculation of relative doses). In a graphic form this information is represented on Fig. 8.29.7.5. The Table and diagram show that consumption of store milk increases on average the dose estimate as compared to the dose in case of consumption of private cow's milk. Goat's milk consumption decreases the dose estimates by 5% on average for the scenarios considered.

Table 8.29.7.5. Influence of milk source on individual dose estimates

ID	Subject	Absolute dose, mGy			Relative dose, %		
		Family cow	Shops	Goat	Family cow	Shops	Goat
1	A	1657	1987	1628	100	120.0	98.3
2	B	599	598	602	100	99.7	100.5
3	C	6330	5960	6269	100	94.2	99.0
4	D	714	737	671	100	103.3	94.0
5	E	208	213	198	100	102.5	95.1
6	V	9144	13368	8990	100	146.2	98.3
7	W	1747	1415	1736	100	81.0	99.4
8	X	2078	2341	1872	100	112.7	90.1
9	Y	1564	1640	1480	100	104.9	94.6
10	Z	909	909	909	100	100.0	100.0

The effect of duration and strategy of use of stable iodine preparations on individual dose estimates is reflected in Table 8.29.7.6. A value of dose estimate in the absence of stable iodine taking is considered as a basic value for calculation of relative dose. The data of Table 8.29.7.6 show that stable iodine taking in initial period of contamination may decrease the dose estimate by 15-20%. A more delayed taking of stable iodine may increase the dose estimate approximately by the same value.

We consider it as advisable to continue the analysis of the influence of concrete factors and their interaction on individual dose estimates in the next quarter.

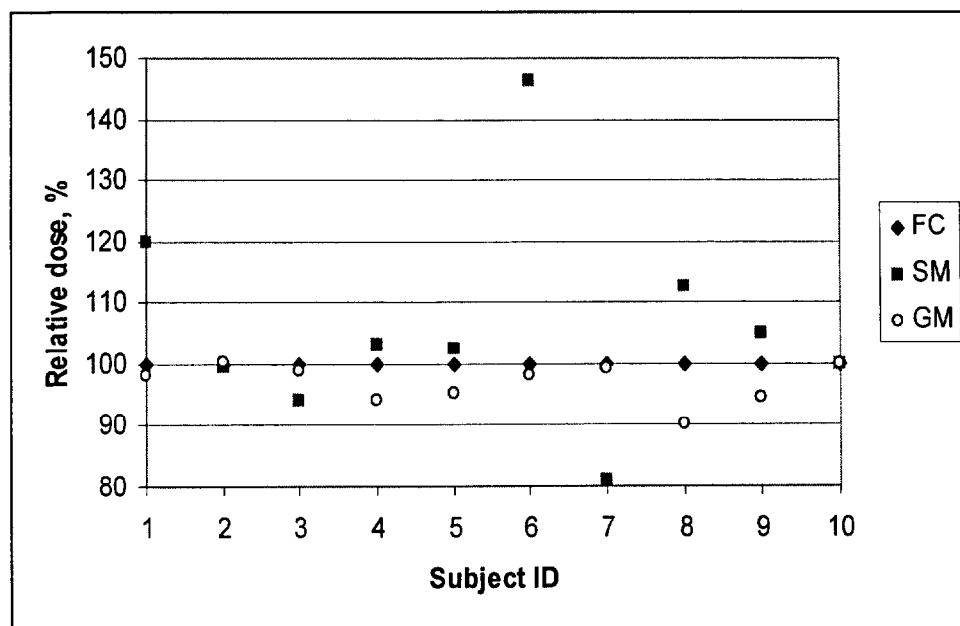


Fig. 8.29.7.5. Subject's relative doses as a function of milk source (FC - private cow's milk; SM - store milk; GM - goat's milk)

Table 8.29.7.6. Influence of the strategy of use of stable iodine on individual dose estimates

ID	Strategy using stable iodine				Absolute dose, mGy				Relative dose, %			
					Subject				Subject			
	Start day1	Duration	Start day2	Duration	A	C	E	Y	A	C	E	Y
1	900 ^a	0	900	0	1657	6038	208	1201	100	100	100	100
2	6	1	900	0	1614	5506	203	1129	97	91	98	94
3	6	3	900	0	1594	4864	203	1055	96	81	98	88
4	6	6	900	0	1658	4234	238	1033	100	70	114	86
5	14	1	900	0	1711	6115	208	1246	103	101	100	104
6	14	3	900	0	1811	6330	208	1337	109	105	100	111
7	14	6	900	0	2012	6900	208	1485	121	114	100	124
8	6	1	14	1	1671	5553	203	1172	101	92	98	98
9	6	3	14	3	1780	4984	203	1204	107	83	98	100
10	6	6	14	6	2330	4608	238	1679	141	76	114	140

8.30. OPERATIONS MANUAL FOR DOSIMETRY: DESCRIPTION OF THE ORGANIZATION AND IMPLEMENTATION OF THE DIRECT THYROID MEASUREMENTS (PROGRESS REPORT)

8.30.3. Foreword

In the process of establishment of dosimetry DB for the Project, couples of Lists have been identified, in which all records were found to be duplicates. When comparing information contained in these couples of Lists, primary Lists have been found, in which information was more complete (complete date of birth indicated in primary List, and date of birth including year and month but without day in the duplicate of this List). Information from primary List was entered into computer dosimetry DB, all paper Lists are being stored, duplicates of paper Lists bear the mark “duplicate”. Table 8.30.3.1 gives a list of previously identified duplicates of Lists.

Table 8.30.3.1. List of previously identified duplicates of lists

# of primary List	# of List-duplicate	Foundations for primary List identification
105_549	98_68	In #105_549 dates of birth are complete; in #98_68 only month and year of birth are indicated.
97_244	95_530	The second page of #95_530 represents a carbon copy
106_548	93_70	List #106_548 contains more complete information on dates of birth for some persons; it also contains information on hours of performing measurements (13-18 h), results of measurements of control source and background by the hour.
70_611	70_621	List #70_621 represents a carbon copy.
105_550	102_69	In #105_550 dates of birth are indicated in full, for half the records in #102_69 only month and year of birth are indicated.

At the stage of formation of the first 20,000-cohort, the DCC has been provided with files “Duplicates” and “Potential duplicates” which contain lists of persons for which there were more than one record in dosimetry DB. The algorithms of forming of these lists have been described in detail in the progress report for 1997. This information has not been used by the DCC in the process of formation of the first 20,000-cohort. The DCC has applied to us for

helping them to prepare materials for establishing the second 20,000-cohort of following-up, and establish over again a list of subjects for which there are several mentions in dosimetry DB. This requires some changes in the algorithm of forming of the lists so that they contain only information that does not raise any doubts.

8.30.4. Main definitions

Let us introduce the following main definitions.

1) Duplicates of records: the result of one measurement for which there are two or more records in primary Lists on paper. The duplicates may be classified as follows:

- a) *primary* record - that has been made on the spot during measurements;
- b) *secondary* record - that has been made after completion of measurements in order to present the results in a form which meets the existing requirements;
- c) *ambiguous* record - when there are no foundations to identify any of the duplicates of records as a primary one.

2) Repeated measurements – records of measurements made at different moments in the same subject.

3) Repeated mention of a subject in dosimetry DB – two or more records in dosimetry DB are available for one subject, which may represent both duplicates of records and repeated measurements.

The three categories of the records in question differ by information coinciding in them, in a way as shown by Table 8.30.4.1

All three categories of the records in question differ by the organization of operations with them (Table 8.30.4.2.), and they are to be identified in dosimetry DB.

Table 8.30.4.1. Characterization of coinciding information in records being identified as «**Duplicates of records**», «**Repeated measurements**», «**Repeated mention of a subject in dosimetry DB**»

Category of record	Coinciding information	Comments
Duplicates of records	Information on the device, background and control source measurements, date and place of measurement, personal subject's identification, place of residence, and result of measurement	Mistakes are not excluded when rewriting any of the parts of information Additional identification of duplicates by copying information by blocks (several records in succession)
Repeated measurements	Personal subject's identification and place of residence	Incompleteness is not excluded in any part of information
Repeated mention of a subject	Personal subject's identification and place of residence are coinciding if the repeated mention of a subject is caused with repeated measurement. The discrepancy in information is not excluded in case of doubling of records been identified.	Incompleteness is not excluded in any part of information

Table 8.30.4.2. Processing of records being identified as «**Duplicates of records**», «**Repeated measurements**», «**Repeated mention of a subject in dosimetry DB**»

Duplicates of records	Repeated measurements	Repeated mention of a subject
After identification of a <i>primary</i> record (based on some argument or by expertise), <i>secondary</i> records are used to restore missing information in <i>primary</i> record concerning the measurement conditions (for example, serial # of device). Subsequently, <i>secondary</i> records are not to be used for dose calculations and analysis of dosimetry data.	They provide additional information on the parameters of ^{131}I intake function and thyroid retention function, on the contribution of radiocesium and superficial contamination into the registered signal; they may be used to specify calibration factors for SRP devices and verify individual dose estimations.	Regardless of the cause of repeated mention of a subject in dosimetry DB (duplicate of record or repeated measurement of a subject), these repeated records are not to be included in the list of persons who will form the cohort of following-up.

8.30.5. Purposes of the work

For the period December 1999 – February 2000, the following tasks have been set in connection with preparation of the Operations Manual:

- 1) to develop an algorithm and identify duplicates of records of the results of measurements made using SRP-68-01 devices for the period May 16 to May 22, 1986 (20,000 records);
- 2) to identify repeated measurements in the same subject in dosimetry DB for measurements made using SRP-68-01 devices for the period May 16 to May 22, 1986 (20,000 records);
- 3) to identify subjects who are found several times in dosimetry DB in order to prepare data for forming the second 20,000-cohort of study subjects.

8.30.6 Identification of duplicates of records

In the process of analysis of primary information in dosimetry DB, it has been found cases of a more complex duplication of records as compared to duplication of the whole List. Certain blocks of lists might be duplicated, and, moreover, duplication might take place both in another List or Lists, and within the same List. On Fig. 8.30.6.1 diagrams of some variants of record duplication are presented. Questioning of medical workers who made measurements showed that official printed forms for recording results might be unavailable at the moment of measurement. In this case, records were made on ordinary paper, and then the results were copied into official forms. The expert dosimetry group was provided with records on printed forms, but, in a number of cases, these might be primary records on paper too. Most often, such a copying of results took place at the beginning of the measurement campaign.

Therefore, the task of identification of duplicated records made with devices of SRP-68-01 type in the process of early measurements has been set to the Dosimetry Group.

In order to identify duplicated records, a VIB sample has been formed from the dosimetry DB for the measurements made from May 16 to May 22, 1986 using devices of SRP-68-01 type.

Identification of duplicated records has been performed for VIB sample using the following algorithm.

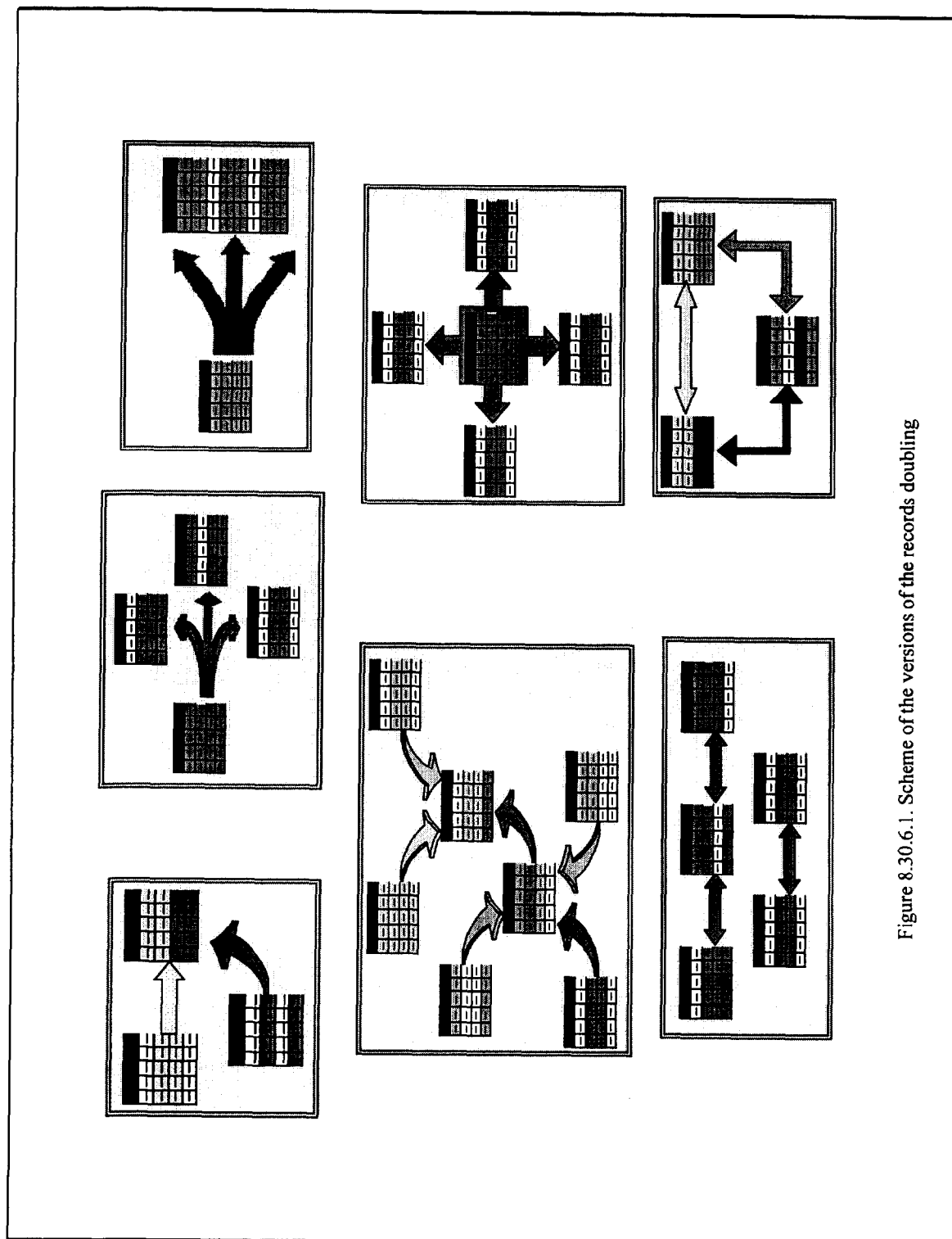


Figure 8.30.6.1. Scheme of the versions of the records doubling

- 1) Using computer linkage, the record to be tested from VIB sample was analyzed for fulfillment of formal conditions of correspondence to other records from VIB sample (a program of comparison is given in Appendix 1).
- 3) The table formed from record duplicates was arranged according to the numbers #File-#List-#Patient, and analyzed visually for identification of blocks of duplicated records. Since in the process of copying records some errors might be committed, formal conditions of linkage may have not been fulfilled for certain records. Therefore, it has been adopted, as one of the additional criteria of duplication, identification of a record within a block of duplicated records, even if with respect to certain conditions the records being compared differed from each other.
- 3) Analysis of the blocks of duplicated records for patients' numbers missed in an arranged sequence.
- 4) Visual analysis of records missed in blocks, their indication as duplicates, registration of errors of copying. It has been found that, most often, in the process of copying information subjects' patronymics have been arbitrarily changed, more rarely subjects' first names, still more rarely their year of birth, place of residence, date of measurement, place of measurement.
- 5) Final visual analysis of lists with duplicated records. Identification of «**primary list**» and, respectively, «**primary record**», and «**secondary record**» in the couple being compared.
- 6) Presentation of the results of the work in the form of diagrams with indication of couples of lists in which there are duplicates, «**primary record**», and number of duplicated records.
- 7) Forming a file of results of identification of record duplicates.

As a rule, information in duplicated records is identical; but in some cases there are discrepancies in different elements of records, and this also concerns the results of measurement, what might be a result of errors in copying. Therefore, identification of the primary source of

information (**primary record**) on the base of which duplication of data was made subsequently is a topical task.

The following criteria have been used for identification of a primary list:

1) The List is considered as a **primary** one if written on sheets of paper on which the whole list of the class has been first printed or handwritten. In this general list those subjects are crossed out for which results of measurements were missing. Most probably, the measurements that had been made were included in this list established beforehand. If the subject was absent at the moment of measurement, he was crossed out from the list. Later the data of measurements were copied into official forms for records, which represented standard printed forms. In this case, we considered all records in the **primary** List as **primary records**. Lists on standard forms are considered as **secondary** Lists, and all records on these as **secondary records**. One more fact pointing out that a List on standard forms was subsequently copied from another List is that the results of blood examination, which might not be available at the moment of measurement, were sometimes included into standard forms. A comparison of results of measurements shows that the data of measurements of exposure dose rate on different parts of the body in **primary** and **secondary** lists are, in most of cases, identical.

2) A List is considered as a **primary** one (and all records on this List as **primary records**), if it is written on notebook sheets or in the form of a rough copy (offhand, careless, “dirty” record). A list referred to **secondary** lists (and all records on this list to **secondary records**) is written on standard forms.

Typical examples of **primary** and **secondary** Lists are given on Fig. 8.30.6.2.

If both lists containing duplicated records were made on standard forms, the **primary** List was identified by expertise, under condition that it contains more complete information for each record.

The results of the work in the form of numbered diagrams are presented on Fig. 8.30.6.3., List 1 - List 5. List 5 contains explanations for the symbols used in diagrams. One may see that besides simple copyings of records from primary list into secondary one, there are more complex variants of repeated copying of records, as shown by diagram #14 Fig. 8.30.6.3. List 5.

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УНБ. N558

СПИСОК *облас.* 20 1958 *до*

учнів підготовчого класу, Базарської середньої
школи на 1985-86 н.р.

№	Прізвище, ім'я, по батькові	Р.н.	Р.з.	Р.м.	Р.ж.
1.	Андрій Павлович	1979	с. Базар	120	40 30 25
2.	Світлана Анатоліївна	1979	с. Базар	300	40 50 60
3.	Руслан Віталійович	1979	"	230	60 60 60
4.	Юрій Павлович	1979	"	50	22 22 26
5.	Олександр Миколайович	1979	"	90	30 30 25
6.	Петро Васильович	1979	"		
7.	Трина Володимирівна	1979	"		
8.	Наталія Володимирівна	1979	"		
9.	Алла Володимирівна	1979	"	400	30 50 50
10.	Оксана Іванівна	1979	"	65	24 22 18
11.	Ярослав Михайлович	1979	"	100	40 30 40
12.	В'ячеслав Валерійович	1979	"		
13.	Ольга Михайлівна	1979	"	76	30 26 28
14.	Віктор Миколайович	1979	"	160	50 45 40
15.	Ірина Валеріївна	1979	"		
16.	Вадим Анатолійович	1979	"		
17.	Микола Миколайович	1979	с. В. Мінська	160	60 60 50
18.	Олександрович	1979	с. Базар		
19.	Оксана Василівна	1979	"	50	25 25 20
20.	Тетяна Миколаївна	1979	"	120	40 30 25
21.	Сергій Анатолійович	1979	с. В. Мінська	420	40 80 110
22.	Галина Вікторівна	1979	с. Базар	45	26 20 18
23.	Наталія Вікторівна	1979	"		
24.	Михайло Анатолійович	1979	"	100	

РІОЦ МОЗ УРСР
ВНХ № 25 с
13.06.86

Figure 8.30.6.2., List 1. An example of primary List

КАРТА № 18.05.86

РАДИОМЕТРИЧЕСКОГО ОБСЛЕДОВАНИЯ ЩИТОВИДНОЙ ЖЕЛЕЗЫ ДЕТЕЙ ШКОЛЬНОГО ВОЗРАСТА

Дата 18.05.86 Место проведения обследования 49

Радиометрический пост Прибор, тип Номер Методика, №

Количество обследованных Счет от источника

Характеристика прибора: фон Счет от источника

Дата приготовления источника , активность

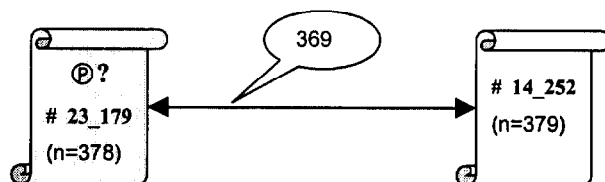
Контроль характеристик прибора:

Время обследования	1	2	3	4	5	6	7	8	9	10	11	12
Счет от источника												
Фон												

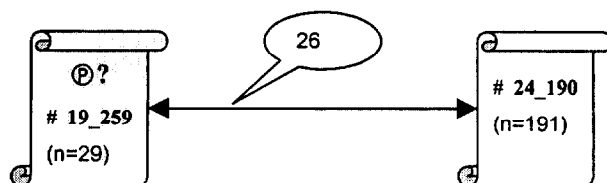
п. №	Фамилия, имя, отчество (полностью)	Год, месяц рождения	Адрес, место жительства, сведения о рождении, паспорт	Номер школы	Местонахождение аварии	Дата эвакуации из района аварии	Результаты измерения		Результаты расчета	
							измерения	% от исп. точки	1	2
1	Светлана	1979	-/-	5	6	7	120	40	30	11
503581	Анна	1979	-/-				300	40	50	60
503582	Юлия	-/-	-/-				230	60	80	40
503583	Александр	-/-	-/-				50	22	12	66
503584	Татьяна	-/-	-/-				90	30	30	25
503585	Анна Владим.	-/-	-/-				400	30	50	50
503586	Оксана	-/-	-/-				65	44	22	18
503587	Снежана	-/-	-/-				100	40	30	40
503588	Анна	-/-	-/-				46	30	26	28
503589	Виктор	-/-	-/-				160	30	40	40

Измерения провела (подпись)

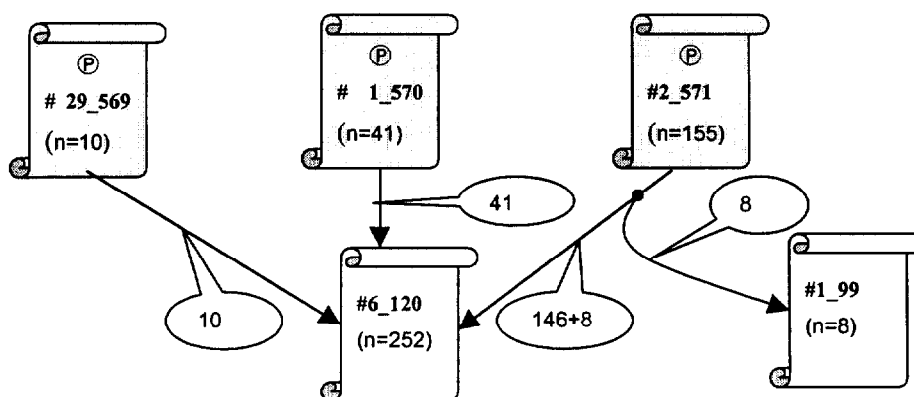
1.



2.



3.



4.

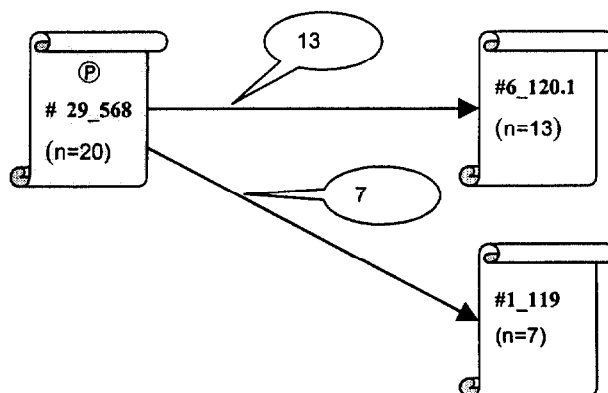
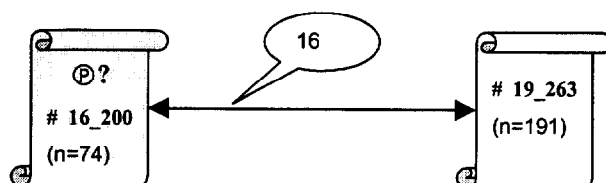
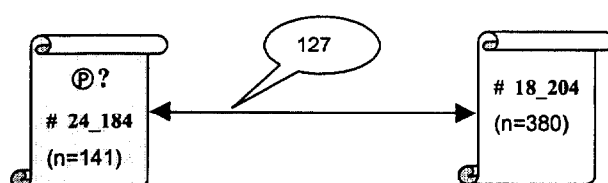


Figure 8.30.6.3, List 1. Diagrams with indication of couples of Lists in which there are duplicates, «**primary record**», and number of duplicated records

5.



6.



7.

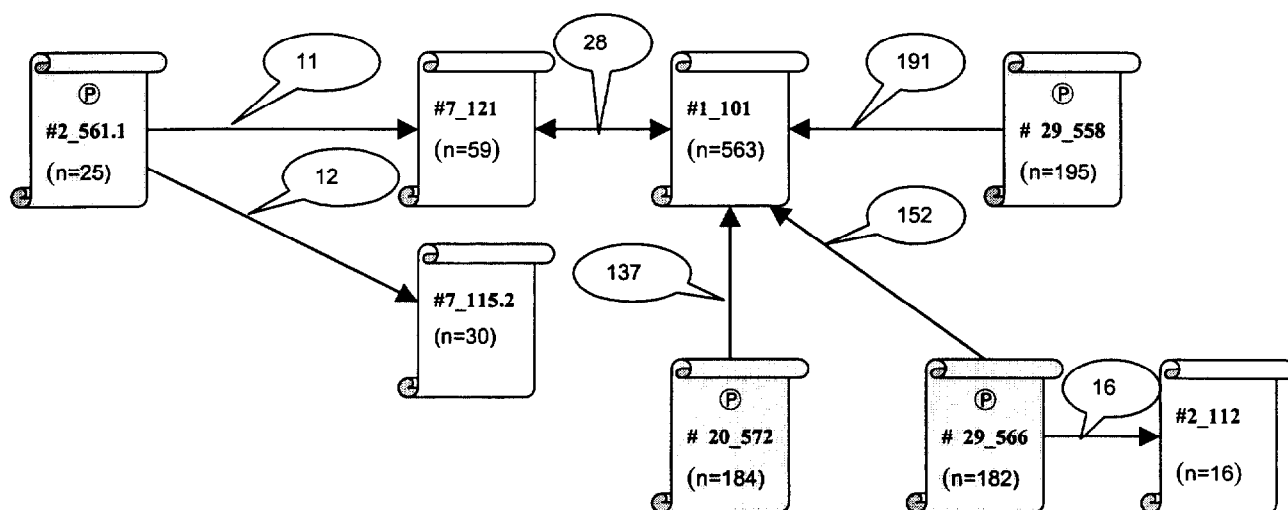
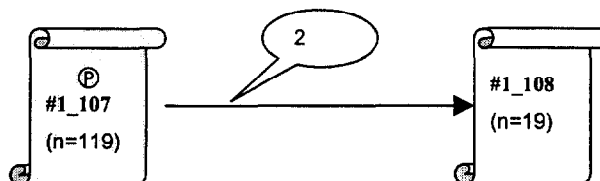
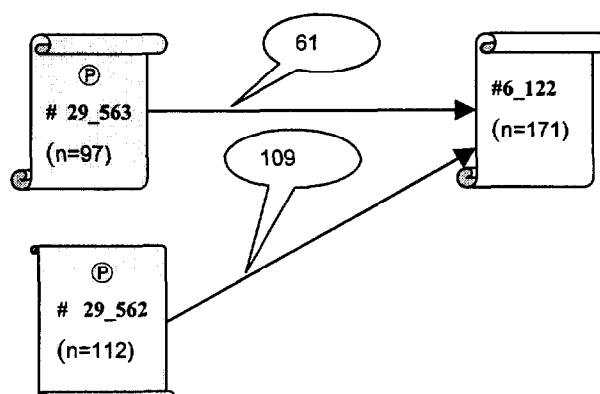


Figure 8.30.6.3, List 2. Diagrams with indication of couples of Lists in which there are duplicates, «**primary record**», and number of duplicated records

8.



9.



10.

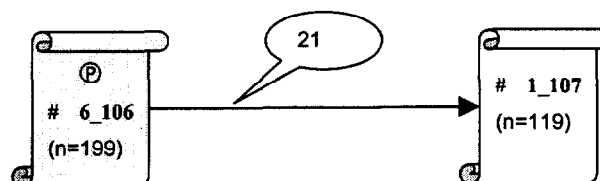
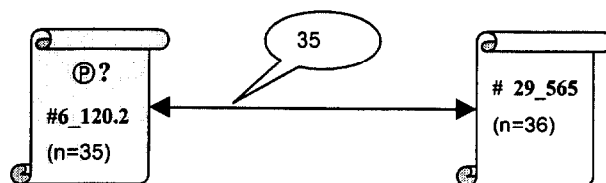
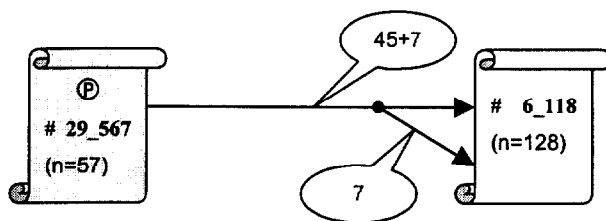


Figure 8.30.6.3, List 3. Diagrams with indication of couples of Lists in which there are duplicates, «**primary record**», and number of duplicated records

11.



12.



13.

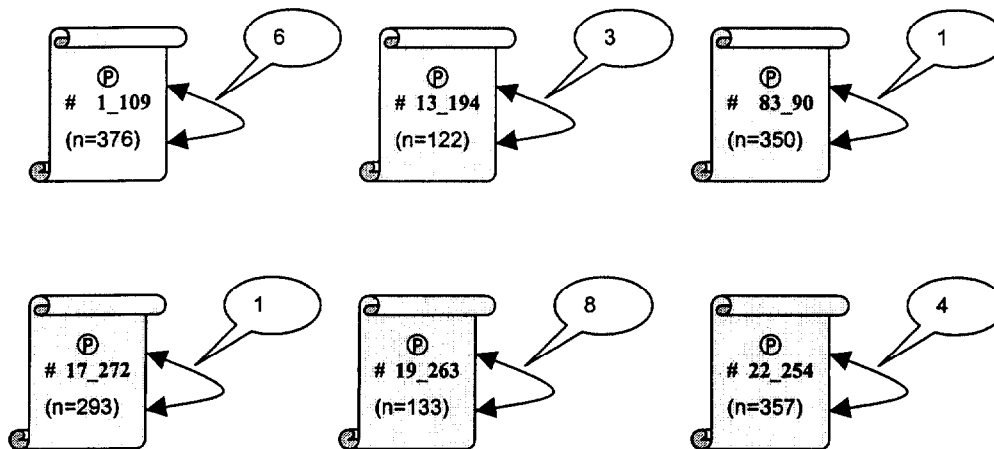
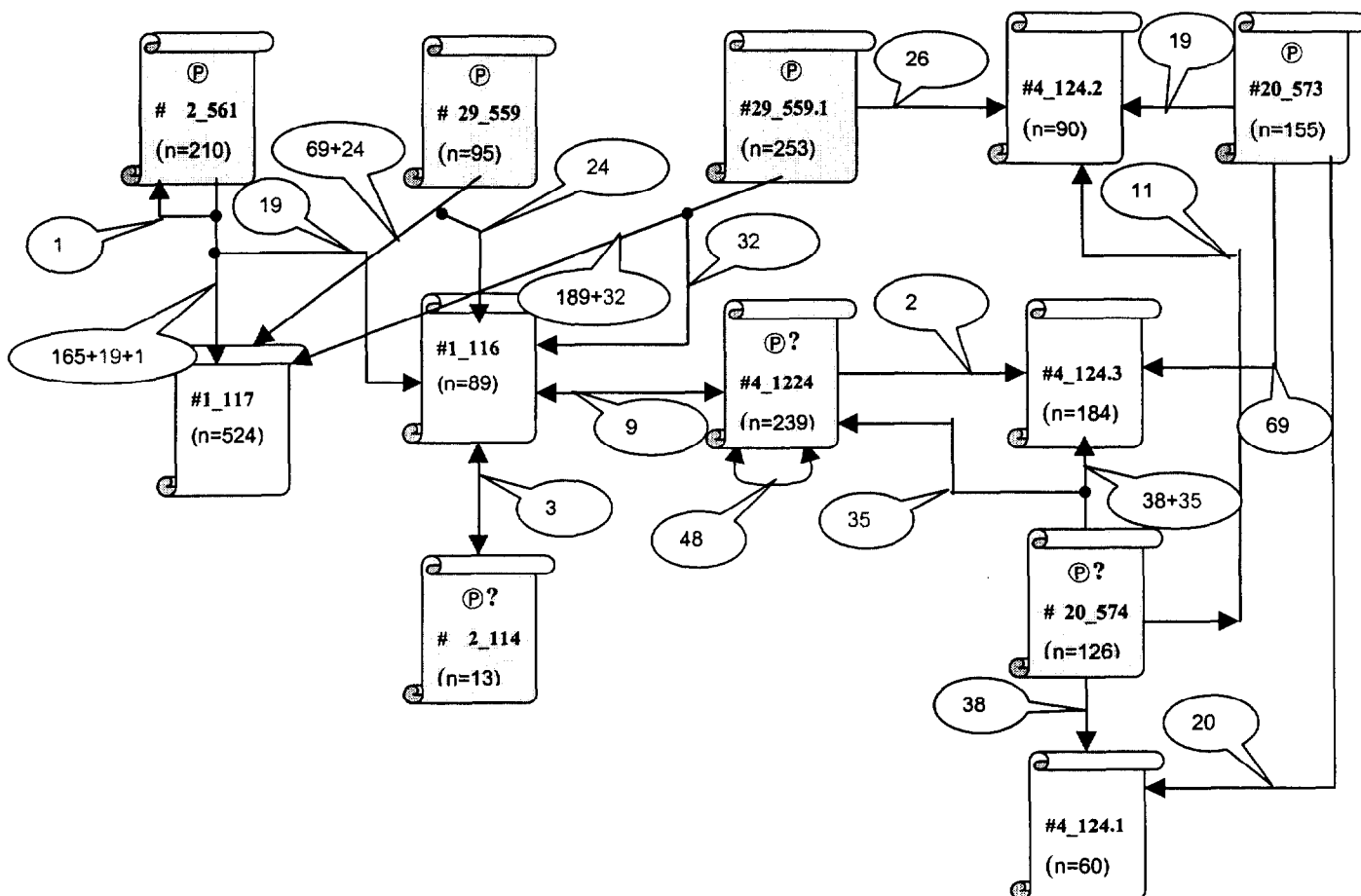


Figure 8.30.6.3, List 4. Diagrams with indication of couples of Lists in which there are duplicates, «**primary record**», and number of duplicated records

14.



2

- number of doubled recods; #1_107 – File_List; (n=119) – total number of records in the List; **P** - indication of **primary** List; **P?** – ambiguous List expertery defined as **primary**

Figure 8.30.6.3, List 5. Diagrams with indication of couples of Lists in which there are duplicates, «**primary record**», and number of duplicated records

The results of identification of record duplicates in a subsample of 20,000 records made using devices of SRP-68-01 type for the period May 16 to May 22, 1986, are contained in dubl1.dbf file which consists of 2556 records (2556 Secondary records). Table 8.30.6.1. describes the structure of dubl1.dbf file.

Table 8.30.6.1. Structure of dubl1.dbf file

Field	Data type	Description
Enum	Text	Identification number of a subject with primary record in dosimetry DB
File	Number	# of the File to which Enum belongs
List	Number	# of the List to which Enum belongs
Pati	Number	Subject's # in the List
Enum_Dubl	Text	Identification number of a subject with secondary record (duplicate to a subject with Enum number)
File_dubl	Number	# of the File to which Enum_dubl belongs
List_dubl	Number	# of the List to which Enum_dubl belongs
Pati_dubl	Number	Subject's # in the List_dubl
Type	Text	It takes one of the three values: first – means that the record determined by Enum number is a primary source for the record determined by Enum_Dubl number; amb – means that there is no reason for affirming that the record determined by Enum number is a primary one (an <i>ambiguous</i> record), and an expert conclusion has been drawn as to the primary character of this record; same - Enum and Enum__dubl belong to the same List.
Note	Text	Comments
Defer	Text	Enumeration of fields for which there are differences in primary and secondary records.

The Dosimetry Group plans to continue the process of identification of duplicated records.

8.30.7. Identification of repeated measurements in the same subject in dosimetry DB

In order to identify repeated measurements in the same subject, the program given in Appendix 2 has been used. This program is based on the assumption and coincidence in records being compared, of information concerning personal identification of a subject (surname, first name, patronymic), year of birth (or date of birth if available, and settlement of residence at the moment of the accident. This program takes into account cases of incomplete information in records (for example, only initials in second record, as compared with complete first name and patronymic in first record).

As a result of operation with this program, a Table is being established with program-matched couples of repeated measurements, as well as duplicated records which satisfy the conditions of the program. This Table was processed according to the following algorithm:

- 1) The records in the Table were compared for coincidence by Enum field with dubl1.dbf file. File dubl1.dbf contains a list of duplicates of records established so far for 20000 measurements made using SRP-68-01 devices within the period May 16 to 22, 1986. Comparison is made to separate the duplicates of records from repeated measurements in the same subject (at present moment, such a separation has been made for 20000 measurements). Using SQL-query, only those records have been left in the Table, which correspond to repeated measurements.

- 2) The Table established in this way was then visually looked through for comparison of information on addresses of residence in a couple of identified repeated measurements (information on address was not formalized in the base and represents a text line which repeats the form of record on primary paper forms).

- 3) After looking through the Table and comparing the addresses, a number of additional, specifying SQL-queries are being conducted. The result obtained after a number of such queries is presented in the form of a file: repead.dbf, whose structure is similar to that of dubl1.dbf file (Table 8.30.7.1).

Table 8.30.7.1. Structure of repead.dbf file

Field	Data type	Description
Enum	Text	Identification number of a subject with the earliest measurement in dosimetry DB
File	Number	# of file to which Enum belongs
List	Number	# of List to which Enum belongs
Pati	Number	Subject's # in a List
Enum2	Text	Identification number of the same subject in case of repeated measurement
File2	Number	# of file to which Enum2 belongs
List2	Number	# of List to which Enum2 belongs
Pati2	Number	Subject's # in List2
Klass	Number	Code-number of the group of sequence of repeated measurements
Klass_num	Text	Number of repeated measurements in the group in question
Note	Text	Comments

In the process of identification of duplicated records, repead.dbf file will be completed.

8.30.8. Identification of cases of repeated mention of a subject in dosimetry DB

This work has been carried out on the request of DCC in order to help them in establishing the new cohort of following up. At this stage, the result of this work may be considered only as a working variant, and not as a final one.

The algorithm of search at the first stage did not differ from the algorithm for identification of repeated measurements in the same subject (chapter 8.30.7.). The Table obtained as a result of operation with this program and visual examination of the Table, was compared for Enum field with dubl1.dbf file in order to add those records which have not be included into it from the available duplicate file. This adding is necessary because, formally, for the duplicates the condition of identity of information concerning the first name and patronymic (sometimes surname as well) may be not fulfilled. As established, in case of duplication of records, errors when copying were observed, and the conclusion that the record in question represents a duplicate is based on comparison of other information blocks as well (results of measurement on different parts of body, sequence of records within the block being copied, etc.). At the same

time, one may not always establish with confidence for duplicated records the primary record with nonmisrepresented information. Therefore, it has been decided to include in the file of results all the variants of spelling of surname, first name and patronymic of a subject, which are available in dosimetry DB. The file of results called resulti.dbf has the following structure (Table 8.30.8.1.).

Table 8.30.8.1. Structure of resulti.dbf file

Field	Date type	Description
ID	Text	Identification ID-number of a subject with the earliest measurement in dosimetry DB for repeated measurements, or with primary record for duplicated records
ID2	Text	Identification ID-number of the same subject in case of repeated measurement or in secondary record
Surname	Text	Last name with the same spelling as for ID
Name	Text	First name with the same spelling as for ID
Patronym	Text	Patronymic with the same spelling as for ID
Birth_year	Number	Year of birth as written down for ID
Locat	Text	Settlement as written down for ID
Surname2	Text	Surname with the same spelling as for ID2
Name2	Text	First name with the same spelling as for ID2
Patronym2	Text	Patronymic with the same spelling as for ID2
Birth_year2	Number	Year of birth as written down for ID2
Locat2	Text	Settlement as written down for ID2

In order that the DCC might prepare the data for establishing the second cohort of following up, it is necessary to carry out linkage of dosimetry file (thyr_dos.dbf), being in the DCC, with resulti.dbf file according to [ID].[thyr_dos]≠[ID2].[resulti] condition. The records remaining in Thyr_dos file after fulfilling this condition will not contain repeated mentions of a subject, and they may be used for establishing the second cohort of following up. Besides, it is important to set aside in the final list of second cohort all the variants of spelling of subject's surname, first name, patronymic, year of birth and settlement of residence, which are found for the same subject in dosimetry DB. This might facilitate subject's search by the Epidemiology Group.

8.3. IMPROVEMENT OF THE QUESTIONNAIRE BASED ON THE EXPERIENCE GAINED

Improved variant of the personal questionnaire is shown below on pages 50 - 54 (File *Quas_se.doc*). Pages 55 - 57 presents the enclosure to personal questionnaire concerning the mother's consumption in the iodine stage of the accident (File *Quas_me.doc*). This annex should be used in case of baby's feeding with breast milk.

Dosimetric questionnaire ID № _____

Questionnaire is filled out ___ / ___ /20 **Interviewer**

☐ The self-administered questionnaire is being used

☐ The questionnaire is to be filled in at home

Who is answering the questions:

1 ☐ Interviewee 2 ☐ Mother 3 ☐ Father 4 ☐ Sister, brother

5 ☐ **Grandmother** 6 ☐ **Other relatives or acquaintances**

[illegible]

2. What is your first name?

[illegible]

4. What was your last name at the time of the Chernobyl accident in 1986 (Answer this question only if the last name has changed)

5. What is your date of birth? ___ / ___ /19__

6. What is your gender? 1 ☐ Male 2 ☐ Female

7. In which settlement are you living now?

[illegible]

7a. Please, name the street, building, apartment in which you live, and phone number.

street [][][][][][][][][][][][][][][][] build. [][][][] apt. [][][] tel. [][][][][][][][][]

7b. In which selsovet (possovet) do you live?

[illegible]

7c. In which raion do you live?

[illegible]

8. Was your address the same at the time of the Chornobyl accident?

1 ☐ **Yes** (go to question 10) 2 ☐ **No**

9. In which settlement were you living at the time of accident?

[illegible]

9a. Please, name the street, building, apartment in which you were living

[illegible]

9b. In which selsovet (possovet) were you living?

[illegible]

9c. In which raion were you living?

[illegible]

10. What was the type of dwelling in which you were living at the time of the Chornobyl accident?

The building was:

1 **wooden**

2  wooden, faced with bricks

3 **brick**

4  **pre-cast concrete**

10a. If the building was a multistory one, what story did you live on? storey

11. Data on moving between 26 April and 30 June, 1986

Please, list all of the places where you stayed for 24 hours or more between April 26 and June 30, 1986, the dates of moving; indicate in the column "Place of stay" whether you attended school or pre-school institutions at that time, stayed in recreation places, in hospital or at home (indicate: **home, school, creche, kindergarten, summer camps, sanatoriums, hospital**). If you don't remember the exact dates, indicate the abbreviated names of period in the column of periods:

Apr (end of April); **May I** (first days of May), **may II** (middle of May), **May III** (end of May), **June** (June).

Residential location			Date of arrival to residential location and of departure from it				Place of stay
			Arrival		Departure		
Oblast	Raion	Settlement	date	period	date	period	
			/		/		
			/		/		
			/		/		
			/		/		
			/		/		
			/		/		

12. Data about places of permanent residence (since July 1, 1986 till now)

Indicate all permanent places of residence in which you lived since July 1986 until now (in case of living in each place more than 6 month). For each settlement indicate the approximate period of residence.

Place of permanent residence			Date (month, year)	
Oblast	Raion	Settlement	Arrival	Departure
			/	/
			/	/
			/	/
			/	/
			/	/
			/	/

13. Where you given medicines in April-May 1986 due to Chornobyl accident?

1 ☐ **Yes** 2 ☐ **No** (go to question 14) 9 ☐ **Don't know** (go to question 14)

13a. Who and where gave you this medicines?

- 1 ☐ **Medical workers in local clinic, hospital**
2 ☐ **Visiting medical team at school (kindergarten) or at home**
3 ☐ **Parents at home**
9 ☐ **Don't know**

13b. Did you take these medicines?

1 ☐ **Yes** 2 ☐ **No** (go to question 14) 9 ☐ **Don't know** (go to question 14)

13c. Indicate if you:

- 1 ☐ **took pills or powder contained iodine**
2 ☐ **dropped iodine solution into water or milk**
3 ☐ **made an application of iodine to the skin**

13d. If you took medicines with iodine, cross out in the table-calendar for April-May 1986 the dates of taking these medicines.

Table-calendar for APRIL-MAY 1986

Mon	Tue	Wed	Thu	Fri	Sat	Sun
					26	27
28	29	30	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

13e. If you took iodine preparations, but you don't remember the dates of taking, indicate the period when you have started taking these:

1 ☐ End of April 2 ☐ First days of May 3 ☐ Middle of May 4 ☐ End of May









13f. How long did you take iodine preparations? _____ days.

13g. Did you take iodine preparations everyday? 1 ☐ Yes 2 ☐ No 9 ☐ Don't know

14. Did you consume milk in 1986 before the Chornobyl accident?

1 ☐ Yes 2 ☐ No (go to question 15) 9 ☐ Don't know (go to question 15)

14a. Indicate how often did you consume milk in 1986 before the Chornobyl accident, the sources of milk, and amount of daily consumption on those days when you drank milk.










Source of milk	How often did you drink milk?				How much milk did you drink per day? (on days when you drank milk)				
	Every day	Several times per week	Once a week	Don't know	0.25 l 	0.5 l  or 	0.75 l   	1 l  	Other amount (in litres per day)
1 <input type="checkbox"/> from store	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
2 <input type="checkbox"/> from family farm	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
3 <input type="checkbox"/> goat milk	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
4 <input type="checkbox"/> dried milk	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
5 <input type="checkbox"/> mother's milk	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
9 <input type="checkbox"/> don't know	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day

14b. Did you change your consumption of milk (including stopping of consumption) or milk sources (for example, you went over to store milk) in connection with the Chornobyl accident?

1 ☐ Yes 2 ☐ No (go to question 15) 9 ☐ Don't know (go to question 15)

14c. . If you changed consumption or sources of milk (for example, in connection with relocations), indicate the date of change and new amount of milk and/or new milk sources. If you don't remember this date, indicate the period using abbreviate name of period:

apr (end of April); may I (first days of May), may II (middle of May), may III (end of May), june (June).

Date or perion in changes in milk consumption		Sources of milk	How much milk did you consume per day?					
			Did not consume 	0.25 l 	0.5 l  or 	0.75 l   	1 l  	Other amount (in litres per day)
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day






ID

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15. If you did not consume milk in April-May 1986, indicate whether you consumed milk soups, porridge, sour clotted milk, sour cream, cream, cottage cheese (cottage cheese pancakes or pudding) at that time?

1 ☐ Yes 2 ☐ No (go to question 16) 9 ☐ Don't know (go to question 16)

15a. For each product listed below indicate how often did you consume it? How many grams of dairy product per day you consumed in days when you consumed it?

Product	How often did you consume the listed dairy products?				How many grams of dairy products per day did you consume? (on days when you consumed these)			
	Every day	Several times a week	Once a week	Don't know	50 g 	100 g  or 	200 g  or 	Other amount (in gramms per day)
1 <input type="checkbox"/> milk soup, porridge	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	___ g per day
2 <input type="checkbox"/> cottage cheese (pudding)	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	___ g per day
3 <input type="checkbox"/> sour milk	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	___ g per day
4 <input type="checkbox"/> sour cream, cream	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	___ g per day

16. If you were living in a village or small town in 1986, please recall whether there was a delay with cattle grazing in 1986 due to flooded pastures?

1 ☐ Yes 2 ☐ No 9 ☐ Don't know

16a. Indicate the date when cattle grazing began in 1986. If you don't remember this date, indicate the period when, in your opinion, cattle grazing could have started.

Cattle grazing began: date: ___/___/1986.

period: 1 ☐ April 2 ☐ First days of may 3 ☐ Middle of May 4 ☐ End of May

17. Did you consume in April-May 1986 fresh green leafy vegetables (vegetables alone or in the form of salads, seasoning for soups, potatoes, porridge)? When answering remember that the following vegetables are referred to green leafy ones: **sorrel, spring onions, parsley, dill, lettuce.**

1 ☐ Yes 2 ☐ No (go to question 18) 9 ☐ Don't know (go to question 18)

17a. In what form did you consume green leafy vegetables? From what date did you begin consuming green leafy vegetables in 1986? Name the dates of beginning of green leafy vegetable consumption. If you don't remember the dates, indicate the periods of beginning of consumption.

In what form did you consume green leafy vegetables?	When did you begin consuming these greens?				
	Date	Period			
		April	first days of May	middle of May	end of May
1 <input type="checkbox"/> Seasoning to dishes (porridge, potatoes, soup)	/ /86	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
2 <input type="checkbox"/> "Green borsch" (sorrel soup)	/ /86	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
3 <input type="checkbox"/> Lettuce or green onion salad	/ /86	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>

17b. Did you stop green leafy vegetable consumption in May 1986 due to Chornobyl accident?

1 ☐ Yes 2 ☐ No (go to question 18) 9 ☐ Don't know (go to question 18)

17c. If you stopped consuming green leafy vegetable in May 1986, indicate the date of stopping. If you don't remember the date, indicate the period.

Stopping of leafy vegetable consumption: date: ___/___/1986

period: 1 ☐ End of April 2 ☐ First days of May 3 ☐ Middle of May 4 ☐ End of May

ID							
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18. Did you take additional measures of personal hygiene after your family found out about the Chornobyl accident? Indicate what measures you took, as well as the date of beginning of taking these measures. If you don't remember the dates, indicate the periods.

Additional measures of personal hygiene	Were the measures in question taken ?			When did you begin taking the measures in question ?				
				Date	Period			
	Yes	No	Don't know		end of April	first days of May	middle of May	end of May
More frequent body washing	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	___/___/86	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
More frequent changing of clothes	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	___/___/86	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>

19. Do you remember thyroid activity measurements in May-June 1986 ? (When measuring activity, the pipe of measuring device was directed towards the neck or applied to it)

1 ☐ **Yes** 2 ☐ **No** (go to question 20)

If you remember activity measurements, answer the questions connected with measurements:

19a. Were you warned that before measurement you have to wash yourself and put on clean clothes ?

1 ☐ Yes 2 ☐ No 9 ☐ Don't know

19b. Did you come to the measurement being clean and changed into clean clothes ?

1 ☐ Yes 2 ☐ No 9 ☐ Don't know

19c. Was your neck wiped with cotton soaked in a solution immediately before measurement?

1 ☐ Yes 2 ☐ No 9 ☐ Don't know

20. If you formerly had traumas of the head or neck, have you X-rays of the head or neck done ?

1 ☐ **Yes** 2 ☐ **No** (go to question 21) 9 ☐ **Don't know** (go to question 21)

20a. Indicate the number of X-rays done during examinations of the head and examinations of the neck:

	Head	Neck
X-ray number		

21. Have you undergone radiation therapy or diagnostic examination using radioactive products for a serious chronic disease?

1 ☐ **No**(go to question 22) 2 ☐ **Treatment** 3 ☐ **Diagnosis**

21a. For each irradiation procedure with diagnostic or therapeutic purpose, name the disease for which irradiation procedure was performed, the date of performance, the name of medical institution and town where it has been performed

Therapy	Diagnosis	Disease	Where the procedure has been performed		When	
			Medical institution	Town	Month	Year
1 <input type="checkbox"/>	2 <input type="checkbox"/>				19__	
1 <input type="checkbox"/>	2 <input type="checkbox"/>				19__	

22. How well does the person having provided information remember the events of 1986:

1 ☐ Well 2 ☐ Fairly 3 ☐ Not well

☐ The questionnaire has been entered into DB

Quality control

Expert's name	Date of control __ / __ /20 __
Conclusion:	

Enclosure to dosimetric questionnaire ID № _____

Regimen of behavior of interviewee's mother during breast feeding

Questionnaire is filled out __ / __ /20 __ Interviewer

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Who is answering the questions:

- 1 ☐ Interviewee's mother 2 ☐ Her husband 3 ☐ Her elder children
5 ☐ Her mother 6 ☐ Other relatives or acquaintances

All questions below apply to the interviewee's mother

23. What is your last name?

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

24. What is your first name?

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

25. What is your patronymic name?

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

26. What was your last name at the time of the Chernobyl accident in 1986 (Answer this question only if the last name has changed)

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

27. What is your date of birth? __ / __ /19__

28. Where you given medicines in April-May 1986 due to Chornobyl accident?

- 1 ☐ Yes 2 ☐ No (go to question 29) 9 ☐ Don't know (go to question 29)

28a. Who and where gave you this medicines?

- 1 ☐ Medical workers in local clinic, hospital
2 ☐ Visiting medical team at school (kindergarten) or at home
3 ☐ Parents at home
9 ☐ Don't know

28b. Did you take these medicines?

- 1 ☐ Yes 2 ☐ No (go to question 29) 9 ☐ Don't know (go to question 29)

28c. Indicate if you:

- 1 ☐ took pills or powder contained iodine
2 ☐ dropped iodine solution into water or milk
3 ☐ made an application of iodine to the skin

28d. If you took medicines with iodine, cross out in the table-calendar for April-May 1986 the dates of taking these medicines.

Table-calendar for APRIL-MAY 1986

Mon	Tue	Wed	Thu	Fri	Sat	Sun
					26	27
28	29	30	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

28e. If you took iodine preparations, but you don't remember the dates of taking, indicate the period when you have started taking these:

- 1 ☐ End of April 2 ☐ First days of May 3 ☐ Middle of May 4 ☐ End of May








28f. How long did you take iodine preparations? _____ days.

28g. Did you take iodine preparations everyday? 1 ☐ Yes 2 ☐ No 9 ☐ Don't know

29. Did you consume milk in 1986 before the Chornobyl accident?

1 ☐ Yes 2 ☐ No (go to question 30) 9 ☐ Don't know (go to question 30)

29a. Indicate how often did you consume milk in 1986 before the Chornobyl accident, the sources of milk, and amount of daily consumption on those days when you drank milk.









Source of milk	How often did you drink milk?				How much milk did you drink per day? (on days when you drank milk)				
	Every day	Several times per week	Once a week	Don't know	0.25 l 	0.5 l  or 	0.75 l  	1 l  	Other amount (in litres per day)
1 <input type="checkbox"/> from store	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
2 <input type="checkbox"/> from family farm	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
3 <input type="checkbox"/> goat milk	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
4 <input type="checkbox"/> dried milk	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
5 <input type="checkbox"/> mother's milk	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
9 <input type="checkbox"/> don't know	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day

29b. Did you change your consumption of milk (including stopping of consumption) or milk sources (for example, you went over to store milk) in connection with the Chornobyl accident?

1 ☐ Yes 2 ☐ No (go to question 30) 9 ☐ Don't know (go to question 30)

29c. If you changed consumption or sources of milk (for example, in connection with relocations), indicate the date of change and new amount of milk and/or new milk sources. If you don't remember this date, indicate the period using abbreviate name of period:

apr (end of April); **may I** (first days of May), **may II** (middle of May), **may III** (end of May), **june** (June).

Date or perion in changes in milk consumption		Sources of milk	How much milk did you consume per day?					
Date	Period		Did not consume 	0.25 l 	0.5 l  or 	0.75 l  	1 l  	Other amount (in litres per day)
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day
___/___/86			9 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	___ l per day

Expert's name		Date of control __ / __ /20 __
Conclusion:		

APPENDIX 1. THE PROGRAM FOR THE FIRST STEP OF IDENTIFICATION OF DUPLICATES OF RECORDS

```

SELECT A
  use new_vib
SELECT C
  use dubl2
SELECT D
  use dvojn
SELECT A
GO TOP
DO WHILE NOT EOF()
  STORE ALLTRIM(new_vib.surname) TO surn1
  STORE LEN(ALLTRIM(surn1)) TO l_surn1
  STORE ALLTRIM(new_vib.name) TO name1
  STORE ALLTRIM(new_vib.patronym) TO patr1
  STORE new_vib.uc TO uc1
  STORE new_vib.berth_year TO birth1
  STORE new_vib.e_num TO enum1
  STORE birth1-1 TO birth12
  STORE birth1+1 TO birth13
  STORE new_vib.num_dev TO num_dev1
  STORE recho() TO no1
  STORE new_vib.dat_meas TO d_meas1
  STORE SUBSTR(SURNAME,1,1) TO first_surn
  IF USED('B')
    SELECT B
    USE
  ENDIF
  DELETE FILE E:\USER\NATA\FOX\back_up.dbf
  IF num_dev1<>0
    SELECT *;
    FROM new_vib;
    WHERE (new_vib.BERTH_YEAR = birth1;
    OR (new_vib.BERTH_YEAR = birth12);
    OR (new_vib.BERTH_YEAR = birth13));
    AND (new_vib.nomer>no1);
    AND ((new_vib.num_dev=0) OR (new_vib.num_dev=num_dev1));
    AND (SUBSTR(new_vib.UC,1,6)=SUBSTR(uc1,1,6));
    AND (SUBSTR(new_vib.SURNAME,1,1)=first_surn);
    AND (ABS(LEN(ALLTRIM(new_vib.SURNAME))-l_surn1)<2);
    INTO TABLE E:\USER\NATA\FOX\back_up
  ELSE
    SELECT *;
    FROM new_vib;
    WHERE (new_vib.BERTH_YEAR = birth1;
    OR (new_vib.BERTH_YEAR = birth12);
    OR (new_vib.BERTH_YEAR = birth13));
    AND (new_vib.nomer>no1);
    AND (SUBSTR(new_vib.UC,1,6)=SUBSTR(uc1,1,6));
    AND (SUBSTR(new_vib.SURNAME,1,1)=first_surn);
    AND (ABS(LEN(ALLTRIM(new_vib.SURNAME))-l_surn1)<2);
    INTO TABLE E:\USER\NATA\FOX\back_up
  ENDIF
  USE
    SELECT B
  use E:\USER\NATA\FOX\back_up
  GO TOP
  DO WHILE NOT EOF()
    STORE 0 TO v_error
    STORE 0 TO v_end
    STORE 0 TO v_sumi
    STORE 0 TO v_surnequ
    STORE 0 TO v_nameequ
    STORE 0 TO v_patrequ
    STORE 0 TO v_notfull

```

```

STORE recno() TO no2
STORE back_up.e_num TO enum2
IF enum1<>enum2
  STORE ALLTRIM(back_up.surname) TO surn2
  STORE ALLTRIM(back_up.name) TO name2
  STORE ALLTRIM(back_up.patronym) TO patr2
  STORE back_up.berth_year TO birth2
  STORE back_up.uc TO uc2
  STORE back_up.dat_meas TO d_meas2
  SELECT C
  set index to enum1
  LOCATE FOR e_num=enum1
  IF FOUND()
    STORE para TO cod1
    LOCATE FOR e_num=enum2
    IF FOUND()
      STORE para TO cod2
      IF cod1=cod2
        STORE 1 TO v_end
      ENDIF
    ENDIF
  ENDIF
ENDIF

*data_meas
IF v_end<>1
  IF MONTH(d_meas1)=MONTH(d_meas2)
    DO CASE
      CASE DAY(d_meas1)=DAY(d_meas2)
        STORE v_sumi+10 TO v_sumi
      CASE DAY(d_meas1)-1=DAY(d_meas2)
        STORE v_sumi+5 TO v_sumi
      CASE DAY(d_meas1)+1=DAY(d_meas2)
        STORE v_sumi+5 TO v_sumi
      OTHERWISE
        STORE 1 TO v_end
    ENDCASE
  ELSE
    STORE 1 TO v_end
  ENDIF
ENDIF

IF v_end=0
  IF sum1<>sum2
    IF nysiis(SURN1)=nysiis(SURN2)
      STORE 1 TO v_surnequ
      STORE v_sumi+10 TO v_sumi
      STORE 1 TO v_error
    ENDIF

    IF mismatch(surn1,surn2,1)
      STORE 1 TO v_surnequ
      STORE v_sumi+10 TO v_sumi
      STORE 1 TO v_error
    ENDIF

    IF incl1(sum1,sum2)
      STORE 1 TO v_surnequ
      STORE v_sumi+10 TO v_sumi
      STORE 1 TO v_error
    ENDIF
  ELSE
    STORE v_sumi+20 TO v_sumi
    STORE 1 TO v_surnequ
  ENDIF

  *name
  IF NOT EMPTY(name1) AND NOT EMPTY(name2)
    IF LEN(name1)<=2 OR LEN(name2)<=2
      STORE 1 TO v_notfull
    IF ATI(name1,name2)

```

```

    STORE 1 TO v_nameequ
    STORE v_sumi+2 TO v_sumi
ENDIF
ELSE
    IF name1=name2
        STORE 1 TO v_nameequ
        STORE v_sumi+10 TO v_sumi
    ENDIF
    IF nysiis(name1)=nysiis(name2) AND v_nameequ=0
        STORE 1 TO v_nameequ
        STORE v_sumi+5 TO v_sumi
        STORE 1 TO v_error
    ENDIF
    IF mismatch(name1,name2,1) AND v_nameequ=0
        STORE 1 TO v_nameequ
        STORE v_sumi+5 TO v_sumi
        STORE 1 TO v_error
    ENDIF
    IF incl1(name1,name2) AND v_nameequ=0
        STORE 1 TO v_nameequ
        STORE v_sumi+5 TO v_sumi
        STORE 1 TO v_error
    ENDIF
    IF v_nameequ=0
        IF LEN(name1)<>LEN(name2)
            IF ATI(name1,name2)
                STORE 1 TO v_notfull
                STORE 1 TO v_nameequ
                STORE v_sumi+2 TO v_sumi
            ENDIF
        ENDIF
    ENDIF
ENDIF
ELSE
    *there is one empty
    STORE 1 TO v_notfull
ENDIF
*patronym
IF NOT EMPTY(pat1) AND NOT EMPTY(pat2)
    IF LEN(pat1)<=2 OR LEN(pat2)<=2
        STORE 1 TO v_notfull
        IF ATI(pat1,pat2)
            STORE 1 TO v_patrequ
            STORE v_sumi+2 TO v_sumi
        ENDIF
    ELSE
        IF pat1=pat2
            STORE 1 TO v_patrequ
            STORE v_sumi+10 TO v_sumi
        ENDIF
        IF nysiis(pat1)=nysiis(pat2) AND v_patrequ=0
            STORE 1 TO v_patrequ
            STORE v_sumi+5 TO v_sumi
            STORE 1 TO v_error
        ENDIF
        IF mismatch(pat1,pat2,1) AND v_patrequ=0
            STORE 1 TO v_patrequ
            STORE v_sumi+5 TO v_sumi
            STORE 1 TO v_error
        ENDIF
        IF incl1(pat1,pat2) AND v_patrequ=0
            STORE 1 TO v_patrequ
            STORE v_sumi+5 TO v_sumi
            STORE 1 TO v_error
        ENDIF
        IF v_patrequ=0
            IF LEN(pat1)<>LEN(pat2)
                IF ATI(pat1,pat2)
                    STORE 1 TO v_notfull
                    STORE 1 TO v_patrequ
                ENDIF
            ENDIF
        ENDIF
    ENDIF

```

```

        STORE v_sumi+2 TO v_sumi
    ENDIF
ENDIF
ENDIF
ELSE
    *there is one empty
    STORE 1 TO v_notfull
ENDIF

*uc
IF uc1=uc2
    v_sumi=v_sumi+10
ELSE
    v_sumi=v_sumi+5
ENDIF

IF (v_sumi>=20) AND (v_sumequ=1)
    SELECT D
    APPEND BLANK
    REPLACE ENUM WITH enum1
    REPLACE ENUM_D WITH enum2
    REPLACE SUMI WITH v_sumi
    REPLACE SURN WITH sum1
    REPLACE SURN_D WITH sum2
    REPLACE NAME WITH name1
    REPLACE NAME_D WITH name2
    REPLACE PATR WITH patr1
    REPLACE PATR_D WITH patr2
    REPLACE UC WITH uc1
    REPLACE UC_D WITH uc2
    REPLACE BIRTH WITH birth1
    REPLACE BIRTH_D WITH birth2
    REPLACE ERROR WITH v_error
    REPLACE SURNEQU WITH v_surnequ
    REPLACE NAMEEQU WITH v_nameequ
    REPLACE PATREQU WITH v_patrequ
    REPLACE NOTFULL WITH v_notfull
ENDIF

*end=0
ENDIF

*enum1=enum2
ENDIF

SELECT B
SKIP
ENDDO

SELECT A
SKIP
ENDDO

PROCEDURE mismatch
PARAMETERS str1,str2,k
IF LEN(str1)<=LEN(str2)
    STORE str1 TO sh_str
    STORE str2 TO lo_str
ELSE
    STORE str2 TO sh_str
    STORE str1 TO lo_str
ENDIF
STORE 0 TO MIS
FOR i=1 TO LEN(sh_str) STEP 1
    IF SUBSTR(sh_str,i,1)<>SUBSTR(lo_str,i,1)
        STORE MIS+1 TO MIS
    ENDIF
ENDFOR
IF MIS>k
    EXIT
ENDIF

```

```

ENDFOR
IF (MIS<=k) AND (ABS(LEN(lo_str)-LEN(sh_str))<=1)
  RETURN .T.
ELSE
  RETURN .F.
ENDIF
PROCEDURE nysiis
PARAMETER str
STORE " " TO newstr
FOR i=1 TO LEN(str) STEP 1
  STORE SUBSTR(str,i,1) TO symbol
  STORE "аоуейиыэяюь" TO NYSSTR
  IF AT(symbol,NYSSTR,1)=0
    STORE newstr+symbol TO newstr
  ENDIF
ENDFOR
RETURN newstr
PROCEDURE incl1
PARAMETERS str1, str2
IF LEN(str1)<=LEN(str2)
  STORE str1 TO sh_str
  STORE str2 TO lo_str
ELSE
  STORE str2 TO sh_str
  STORE str1 TO lo_str
ENDIF
STORE 0 TO notequ1
STORE 1 TO res
IF LEN(lo_str)-LEN(sh_str)=1
  FOR i=1 TO LEN(sh_str) STEP 1
    IF notequ1=0
      IF SUBSTR(sh_str,i,1)<>SUBSTR(lo_str,i,1)
        STORE 1 TO notequ1
      ENDIF
    ELSE
      IF SUBSTR(sh_str,i-1,1)<>SUBSTR(lo_str,i,1)
        STORE 0 TO res
        EXIT
      ELSE
        IF i=LEN(sh_str)
          IF SUBSTR(sh_str,i,1)<>SUBSTR(lo_str,i+1,1)
            STORE 0 TO res
            EXIT
          ENDIF
        ENDIF
      ENDIF
    ENDIF
  ENDFOR
ELSE
  STORE 0 TO res
ENDIF
IF res=1
  RETURN .T.
ELSE
  RETURN .F.
ENDIF
procedure ATI
PARAMETERS str1, str2
IF LEN(str1)<=LEN(str2)
  STORE str1 TO sh_name
  STORE str2 TO lo_name
ELSE
  STORE str2 TO sh_name
  STORE str1 TO lo_name
ENDIF
IF AT(sh_name,lo_name,1)<>0
  RETURN .T.
ELSE
  RETURN .F.
ENDIF

```

APPENDIX 2. THE PROGRAM FOR THE FIRST STEP OF IDENTIFICATION OF REPEATED MEASUREMENTS IN THE SAME SUBJECT

```

SET PATH TO E:\USER\NATA\FOX
close databases

SELECT A
    use new_vib

SELECT C
    use dubl1

SELECT D
    use dvoim

SELECT A
GO TOP

DO WHILE NOT EOF()

    STORE ALLTRIM(new_vib.surname) TO sum1

    STORE LEN(ALLTRIM(sum1)) TO l_sum1

    STORE ALLTRIM(new_vib.name) TO name1
    STORE ALLTRIM(new_vib.patronym) TO patr1
    STORE new_vib.uc TO uc1
    STORE new_vib.berth_year TO birth1
    STORE new_vib.e_num TO enum1
    STORE birth1-1 TO birth12
    STORE birth1+1 TO birth13
    STORE recho() TO no1
    STORE SUBSTR(SURNAME,1,1) TO first_sum
    IF USED('B')
    SELECT B
    USE
    ENDIF
    DELETE FILE E:\USER\NATA\FOX\back_up.dbf

    SELECT *;
    FROM new_vib;
    WHERE (new_vib.BERTH_YEAR = birth1;
    OR (new_vib.BERTH_YEAR = birth12);
    OR (new_vib.BERTH_YEAR = birth13));
    AND (new_vib.nomer>no1);
    AND (SUBSTR(new_vib.UC,1,6)=SUBSTR(uc1,1,6));
    AND (SUBSTR(new_vib.SURNAME,1,1)=first_sum);
    AND (ABS(LEN(ALLTRIM(new_vib.SURNAME))-l_sum1)<2);
    INTO TABLE E:\USER\NATA\FOX\back_up
    USE

    SELECT B
    use E:\USER\NATA\FOX\back_up

GO TOP
DO WHILE NOT EOF()
    STORE 0 TO v_error
    STORE 0 TO v_end
    STORE 0 TO v_sumi

```

```

STORE 0 TO v_surnequ
STORE 0 TO v_nameequ
STORE 0 TO v_patrequ
STORE 0 TO v_notfull
STORE recno() TO no2
ACTIVATE WINDOW WIN1
SET TALK ON
@ 1,40 SAY 'no1'+STR(no1)+' no2'+STR(no2)
STORE back_up.e_num TO enum2
IF enum1<>enum2
STORE ALLTRIM(back_up.surname) TO sum2
STORE ALLTRIM(back_up.name) TO name2
STORE ALLTRIM(back_up.patronym) TO patr2
STORE back_up.berth_year TO birth2
STORE back_up.uc TO uc2
SELECT C
set index to enum1
LOCATE FOR e_num=enum1
IF FOUND()
STORE para TO cod1
LOCATE FOR e_num=enum2
IF FOUND()
STORE para TO cod2

IF cod1=cod2
STORE 1 TO v_end
ENDIF
ENDIF
ENDIF

IF v_end=0
IF sum1<>sum2
IF nyslis(SURN1)=nyslis(SURN2)
STORE 1 TO v_surnequ
STORE v_sumi+10 TO v_sumi
STORE 1 TO v_error
ENDIF

IF mismatch(surn1,surn2,1)
STORE 1 TO v_surnequ
STORE v_sumi+10 TO v_sumi
STORE 1 TO v_error
ENDIF

IF incl1(sum1,surn2)
STORE 1 TO v_surnequ
STORE v_sumi+10 TO v_sumi
STORE 1 TO v_error
ENDIF
ELSE
STORE v_sumi+20 TO v_sumi
STORE 1 TO v_surnequ
ENDIF

*name
IF NOT EMPTY(name1) AND NOT EMPTY(name2)
IF LEN(name1)<=2 OR LEN(name2)<=2
STORE 1 TO v_notfull
IF AT1(name1,name2)
STORE 1 TO v_nameequ
STORE v_sumi+2 TO v_sumi
ENDIF
ELSE
IF name1=name2
STORE 1 TO v_nameequ
STORE v_sumi+10 TO v_sumi
ENDIF
IF nyslis(name1)=nyslis(name2) AND v_nameequ=0
STORE 1 TO v_nameequ
STORE v_sumi+5 TO v_sumi

```

```

    STORE 1 TO v_error
ENDIF
IF mismatch(name1,name2,1) AND v_nameequ=0
    STORE 1 TO v_nameequ
    STORE v_sumi+5 TO v_sumi
    STORE 1 TO v_error
ENDIF
IF incl1(name1,name2) AND v_nameequ=0
    STORE 1 TO v_nameequ
    STORE v_sumi+5 TO v_sumi
    STORE 1 TO v_error
ENDIF
IF v_nameequ=0
    IF LEN(name1)<>LEN(name2)
        IF AT1(name1,name2)
            STORE 1 TO v_notfull
            STORE 1 TO v_nameequ
            STORE v_sumi+2 TO v_sumi
        ENDIF
    ENDIF
ENDIF
ENDIF
ELSE
    *there is one empty
    STORE 1 TO v_notfull
ENDIF

*patronym
IF NOT EMPTY(pat1) AND NOT EMPTY(pat2)
IF LEN(pat1)<=2 OR LEN(pat2)<=2
    STORE 1 TO v_notfull
    IF AT1(pat1,pat2)
        STORE 1 TO v_patrequ
        STORE v_sumi+2 TO v_sumi
    ENDIF
ELSE
    IF patr1=patr2
        STORE 1 TO v_patrequ
        STORE v_sumi+10 TO v_sumi
    ENDIF
    IF nysiis(pat1)=nysiis(pat2) AND v_patrequ=0
        STORE 1 TO v_patrequ
        STORE v_sumi+5 TO v_sumi
        STORE 1 TO v_error
    ENDIF
    IF mismatch(pat1,patr2,1) AND v_patrequ=0
        STORE 1 TO v_patrequ
        STORE v_sumi+5 TO v_sumi
        STORE 1 TO v_error
    ENDIF
    IF incl1(pat1,patr2) AND v_patrequ=0
        STORE 1 TO v_patrequ
        STORE v_sumi+5 TO v_sumi
        STORE 1 TO v_error
    ENDIF
    IF v_patrequ=0
        IF LEN(pat1)<>LEN(pat2)
            IF AT1(pat1,patr2)
                STORE 1 TO v_notfull
                STORE 1 TO v_patrequ
                STORE v_sumi+2 TO v_sumi
            ENDIF
        ENDIF
    ENDIF
ENDIF
ELSE
    *there is one empty
    STORE 1 TO v_notfull
ENDIF

```

```

*uc
IF uc1=uc2
  v_sumi=v_sumi+10
ELSE
  v_sumi=v_sumi+5
ENDIF

IF ((v_sumi>=20) AND (v_nameequ=1) AND (v_surnequ=1) AND (v_patrequ=1))
  SELECT D
  APPEND BLANK
  REPLACE ENUM WITH enum1
  REPLACE ENUM_D WITH enum2
  REPLACE SUMI WITH v_sumi
  REPLACE SURN WITH sum1
  REPLACE SURN_D WITH surn2
  REPLACE NAME WITH name1
  REPLACE NAME_D WITH name2
  REPLACE PATR WITH patr1
  REPLACE PATR_D WITH patr2
  REPLACE UC WITH uc1
  REPLACE UC_D WITH uc2
  REPLACE BIRTH WITH birth1
  REPLACE BIRTH_D WITH birth2
  REPLACE ERROR WITH v_error
  REPLACE SURNEQU WITH v_surnequ
  REPLACE NAMEEQU WITH v_nameequ
  REPLACE PATREQU WITH v_patrequ
  REPLACE NOTFULL WITH v_notfull
ENDIF
*end=0
ENDIF

*enum1=enum2
ENDIF

SELECT B
SKIP
ENDDO

SELECT A
SKIP
ENDDO

PROCEDURE mismatch
PARAMETERS str1,str2,k
IF LEN(str1)<=LEN(str2)
  STORE str1 TO sh_str
  STORE str2 TO lo_str
ELSE
  STORE str2 TO sh_str
  STORE str1 TO lo_str
ENDIF
STORE 0 TO MIS
FOR i=1 TO LEN(sh_str) STEP 1
  IF SUBSTR(sh_str,i,1)<>SUBSTR(lo_str,i,1)
    STORE MIS+1 TO MIS
  ENDIF
IF MIS>k
  EXIT
ENDIF
ENDFOR

IF (MIS<=k) AND (ABS(LEN(lo_str)-LEN(sh_str))<=1)
  RETURN .T.
ELSE
  RETURN .F.
ENDIF

PROCEDURE nysiis
PARAMETER str

```

```

STORE " TO newstr
FOR i=1 TO LEN(str) STEP 1
  STORE SUBSTR(str,i,1) TO symbol
  STORE "аоеийыэюяь" TO NYSSTR
  IF AT(symbol,NYSSTR,1)=0
    STORE newstr+symbol TO newstr
  ENDIF
ENDFOR
RETURN newstr

PROCEDURE incl1
PARAMETERS str1, str2
IF LEN(str1)<=LEN(str2)
  STORE str1 TO sh_str
  STORE str2 TO lo_str
ELSE
  STORE str2 TO sh_str
  STORE str1 TO lo_str
ENDIF
STORE 0 TO notequ1
STORE 1 TO res
IF LEN(lo_str)-LEN(sh_str)=1
  FOR i=1 TO LEN(sh_str) STEP 1
    IF notequ1=0
      IF SUBSTR(sh_str,i,1)<>SUBSTR(lo_str,i,1)
        STORE 1 TO notequ1
      ENDIF
    ELSE
      IF SUBSTR(sh_str,i-1,1)<>SUBSTR(lo_str,i,1)
        STORE 0 TO res
        EXIT
      ELSE
        IF i=LEN(sh_str)
          IF SUBSTR(sh_str,i,1)<>SUBSTR(lo_str,i+1,1)
            STORE 0 TO res
            EXIT
          ENDIF
        ENDIF
      ENDIF
    ENDIF
  ENDFOR
ELSE
  STORE 0 TO res
ENDIF

IF res=1
  RETURN .T.
ELSE
  RETURN .F.
ENDIF

procedure ATI
PARAMETERS str1, str2
IF LEN(str1)<=LEN(str2)
  STORE str1 TO sh_name
  STORE str2 TO lo_name
ELSE
  STORE str2 TO sh_name
  STORE str1 TO lo_name
ENDIF
IF AT(sh_name,lo_name,1)<>0
  RETURN .T.
ELSE
  RETURN .F.
ENDIF

```